MEMBER AUDIT BUREAU OF CIRCULATIONS

THE WELDING ENGINEER

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Defining Our Objective

TACKLING a new job always demands some pretty hard concentration to get the "feel" of the new job and gain the right perspective. An editor's job presents a host of problems to a new man just taking hold. The biggest problem any editor has to grapple with is the determination of the "editorial objective" of his paper and development of an "editorial plan" to carry the paper forward in the direction of the desired objective.

It is the editor's purpose at the moment to take the readers of *The Welding Engineer* into his confidence and outline in a general way what his plan of action is going to be. With the engineering method rigorously drilled into his thinking, the natural steps are these:

1. Assemble all information possible in the time available relating to the editorship of the paper.

2. Analyze this data; determine the most significant facts; evaluate their relative importance; and detect important relationships between groups of data.

3. Determine, from the study of the facts, the best editorial objective; build a plan to carry *The Welding Engineer* always in the direction of the determined objective.

4. Set up the procedure for executing the plan; see that each step is carefully carried out.

One thing is very certain—the success of *The Welding Engineer* is inextricably tied up with the advancement of the welding industry. This paper has the same basic objective as the American Welding Society, the official spokesman for all the groups which make up the welding industry. *The Welding Engineer* must continually work to further the advancement of welding in all the varied branches of industry, to stimulate new markets, to disseminate vital information on new technical developments and to give adequate emphasis to the economic aspects of welding.

From facts already assembled by the editor, it seems evident that the welding industry has three major stories to keep on telling:

(1) The Economic Story—The dollars and cents side, when adequately publicized, gets the attention of the key men in the manufacturing and structural fabricating industries. These men control the purse strings on equipment buying and engineering development. When they become seriously interested in welding as an economic production tool, the advancement of welding is promoted.

(2) The Application Story—The detailed working out of problems related to application engineering is left to design engineers and production executives. This important aspect of welding has been described as the mechanical side. *The Welding Engineer* has a most important function to perform in application engineering. Most of its readers are vitally interested in this side of the subject, because their bread and butter is made by applying welding to production or maintenance problems. Here is where "how-to-do-it" information is most valuable. The younger men particularly want educational material dealing primarily with application engineering.

(3) The Metallurgical Story—The metallurgical development problems of welding comprise the third aspect of the industry served by *The Welding Engineer*. The manufacturers of welding equipment, rods, electrodes, gases, etc., are keenly interested in the metallurgical side of the subject. There are many engineers in large manufacturing establishments who are vitally interested in the metallurgy of welding. And the steel companies which produce the rolled steel plates and shapes for welded fabrication are watching the metallurgical developments, because their markets depend a great deal upon the welding qualities of their steels. The same is true of the mills which produce corrosion-resisting and abrasion-resisting alloys.

The editorial objective of *The Welding Engineer* will be formulated on the basis of the foregoing analysis, giving due emphasis to each side of welding as seems advisable to promote the best interests of the industry. Our objective, once it is definitely formulated, will be flexible enough to permit adjustments in emphasis as conditions may change with new developments. Any suggestions or constructive criticisms from readers will always be welcome.

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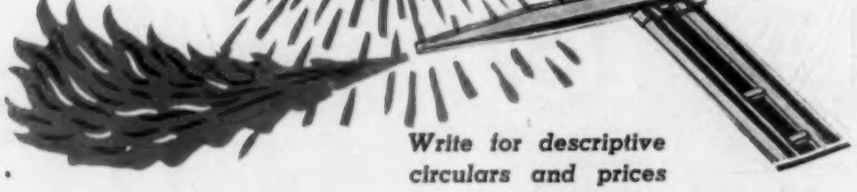

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Flame Hardening Of Machine Parts

Heat treatment of large gears accomplished without distortion—Surface hardens only to depth desired

By L. A. LINDBERG
Vice President, Lindberg Steel Treating Co., Chicago

DURING the last few years rapid progress has been made in the development of apparatus for hardening gears and parts of any size by the use of the oxy-acetylene flame. This process surface hardens the teeth only to a depth necessary to provide a case where maximum wear occurs. By this process distortion is eliminated.

In surface hardening of steel, regardless of the method which may be employed, the desirable condition is to raise the part of the surface to be hardened out of the critical temperature, while keeping as much heat as possible out of the core metal. This ideal is easily realized in case hardening low carbon steels, but with high carbon steels both the surface and core undergo certain physical transformations which set up internal stresses in the hardened case. Our experience with flame hardening, using specially designed oxy-acetylene blowpipes indicates that metallurgical changes in the core of high carbon steels are minimized and internal stresses are avoided.

Another advantage is the elimination of distortion of parts hardened which was always thought of as a necessary evil until the development of flame hardening. Also, there is a reduction in spalling and chipping which are common with very hard cases. Relatively ductile cases are formed on machine parts of such size and shape as to be difficult, if not impractical, to handle by any other method. These features are distinct advantages.

The heat treatment of gears has been one of the most difficult operations to accomplish without distortion. Small gears have been successfully treated by quenching in a special quenching machine, where the gear is held under pressure between dies and submerged into the quenching medium. Large gears up to six feet in diameter have been heated and quenched in open quenching tanks where no means are available to provide special fixtures. This results in considerable distortion. The amount of distortion is usually governed by the design or shape of the gear. The small quantities of large gears of duplicate design requiring heat treatment does not warrant the construction of special dies and machines for quenching them because of the cost involved.

In the flame hardening process as applied on large gears an operating head designed to carry an oxy-acetylene blowpipe and quenching apparatus in proper relation to the work is mounted upon a track. The head is provided with controls that enable the operator to accurately adjust the flame and movement of the apparatus. These controls are arranged with sensitive movements in various directions to facilitate adjustment if necessary during the actual operation, although the setting up may be so correct that further alteration is unnecessary during operation.

Blowpipe and quenching apparatus are mounted upon an easily controlled operating head

The flame-hardening process does not alter the chemical composition of the steel. When first introduced, the impression was spread that the excess-acetylene flame added carbon to the steel but this is definitely not so.

The high temperature of the oxy-acetylene flame raises the metal rapidly to its critical temperature and covers a definite area in relation to the size of the heating head employed in a given time. The size of the heating flames in relation to the surface to be hardened governs the depth of treatment or the penetration of hardness produced.

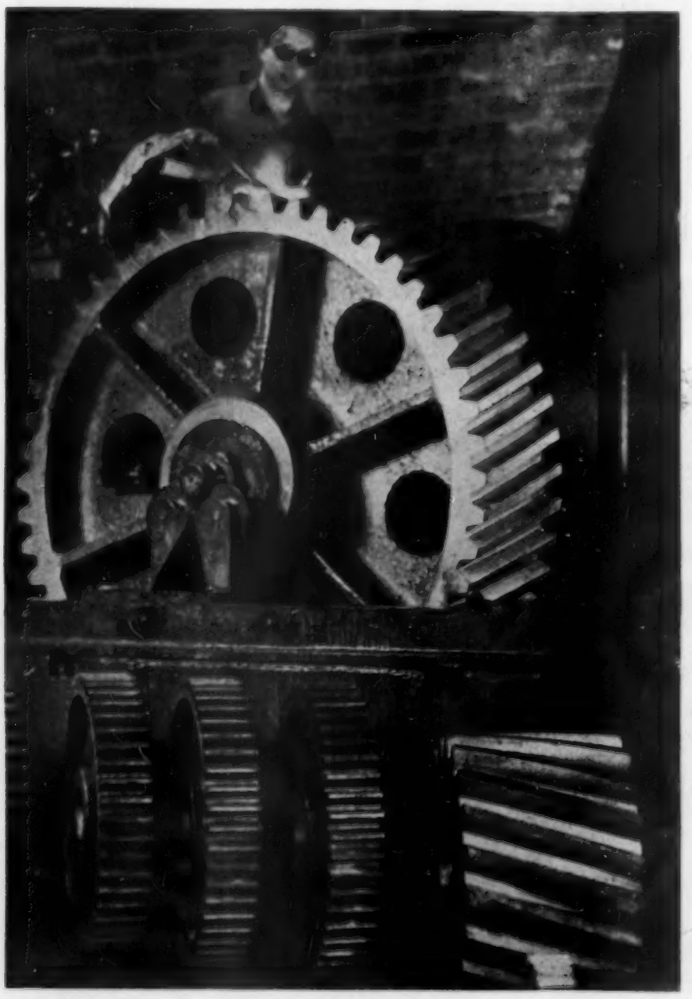
Having raised the temperature of the metal to the critical point, care is taken to follow the path of the heating head with a quenching jet of water or other quenching medium. This process contributes much to ensure uniform hardening of the gear teeth.

When steel is heated above its critical point the carbon is brought into a state of what is known as solid solution with the iron, or in other words, it is diffused throughout the mass. When the temperature is allowed to fall below that point, the iron and the carbon commence to come out of solution and to re-crystallize until the steel has again reached its original condition by gradual cooling.

When the cooling is rapid or sudden as in this process, the constituents have not time to come out of solution and the structure developed by heating is arrested. Thus we have a martensitic (hard) structure upon the face of the gear teeth.

Hardening of Thin Sections

With flame hardening, the hardness obtained is equal to or better than that obtained by furnace hardening methods. On heavy pieces the unheated metal assists the quenching medium and allows a more moderate external quench than with furnace hardening. With furnace methods, the hardening of thin sections is generally avoided, because slow speed of heating raises the temperature of the entire section to the critical point, thereby losing certain desirable physical qualities when quenched. The higher speed of localized heating with the oxy-acetylene blowpipe permits surface hardening of sections as thin as ⅜ in. or less with correct technique.



The center, root, and core of gear teeth remain unchanged after surface has been hardened

Having in mind what has been said about the method of carrying out this process, we can readily see that the volume of metal absorbing heat at any moment is small compared with the mass and is kept very carefully within defined limits by the quenching arrangements which carry away all surplus heat.

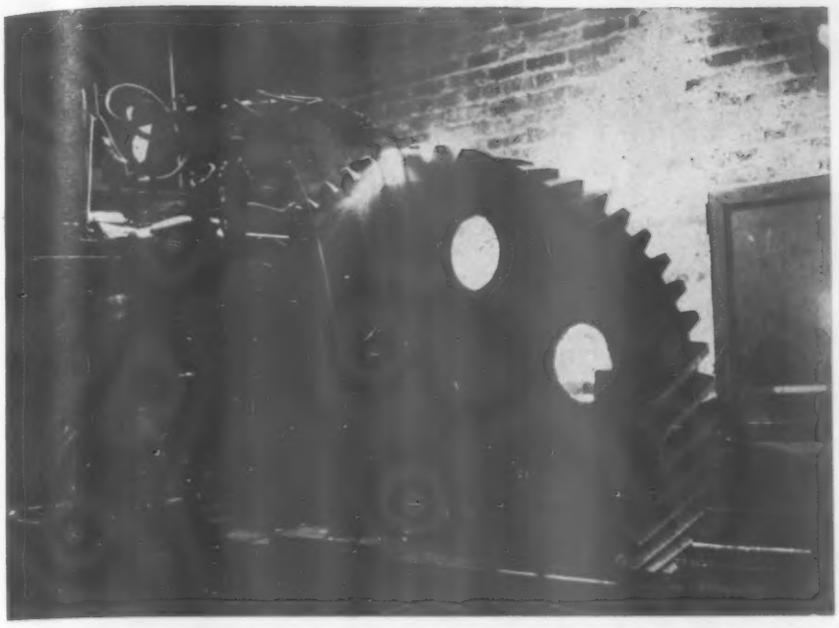
Perhaps the most convincing proof of the claims made in this connection is the fact that the center, root and core of a gear tooth of even small dimensions, remain unchanged (soft) after the surface has been hardened.

Distortion of metal depends on thickness of section and depth of hardening. For this reason care must be used in hardening thin sections. Thick sections are not a problem because the core is only moderately heated thus maintaining the surface contour. Depth of hardening is controllable by heat of flame and rate of movement between flame and work. Since both variables are readily controlled, case depth can be made uniform (ordinarily 1/16 to 1/4 in.).

An advantage of flame hardening is its flexibility as to size and shape of piece to be hardened. The process is portable in its set-up, permitting the tool to be brought to the work. High adaptability and portability of apparatus stand out as economic advantages which give promise of greater usefulness of this comparatively new process. Such diversified parts as crank shafts, cam shafts, valves and valve seats, gears, machine ways, pulley sheaves, pump liners, and many others are being flame hardened.

Steels to Flame Harden

Flame hardening can be used with any steel which may be cased by simple heating and quenching. To get a high degree of hardness, carbon content should be at least 0.40 per cent. With more than 0.70 per cent carbon, greater caution is needed to prevent surface checking or cracking. In general, low alloy steels are most desirable for flame hardening, but some of the high alloy steels can be hardened with an air quench. Fine-grained steels are easier to flame harden than coarse-grained steels. Vanadium alloy steels are well adapted to flame hardening because of the fine grain structure. Alloy steels will resist tempering to a better degree than plain carbon steels. Tempering takes place in the core immediately under the surface which has been hardened. This may be of design im-



Multiple tip heads are often used on blowpipe in order to insure uniform heating

portance where high fatigue stresses are encountered.

The blowpipe used for flame hardening must possess enough strength and flexibility to operate under rather severe conditions. Equipment must be water-cooled and have sufficient gas capacity to cover an area of reasonable size in a single operation. Multiple tip heads are often used in order to insure uniform heating. These are available in several sizes, the tips being threaded and removable. They can be obtained in various lengths and with various sizes of tip orifices. Especially designed heads are used for such work as gear tooth hardening and crankshaft hardening. In many operations it has been found convenient to mount the flame hardening equipment on one of the standard gas cutting machines. These are ideal for the purpose, because flame hardening speeds are usually within the range obtainable with gas cutting equipment. These machines have also been used as motive power to rotate jigs to hold the work in continuous hardening of small parts.

For most work a small stream of water is adequate to cover the area to be hardened. Where a larger area must be covered, a fan-shaped nozzle or spray must be used. Either one is simple to make or purchase. The pipe carrying the quenching water should be so fastened as to permit adjustment which will direct the stream on the steel. The water stream should follow the last flame very closely but without interfering with it. Best results are realized when the blowpipe cooling and quenching water are independently controlled.

The operation of flame hardening should be followed immediately by a low-temperature stress relieving draw. Temperature need not exceed 400 deg. F. and may be done in an oil bath or furnace. This reduces tendency to surface checking or cracking, and when properly handled will not reduce the surface hardness.

Speed of Flame Travel

For some work the blowpipe and steel being hardened are held motionless. Where there is relative movement between the blowpipe and the work, the speed of flame travel is determined by such variables as flame intensity, type of steel, and hardening temperature. Speed may vary from 4 to 10 inches per minute, but usually is 6 to 8 inches per minute. The head of the blowpipe should be so adjusted that the tips of the inner flame cones are 1/16 to ⅛ in. away from the surface being hardened.

To harden a plane surface, the blowpipe is directed along the surface at the highest speed, which will heat the steel to the hardening temperature. Behind the flame is a stream of water which quenches the heated surface immediately after it has reached the proper temperature. On circular work of large diameter, such as big gears, each tooth is handled consecutively (both heating and quenching) until the entire circumference is covered.

Britain's Rail Welding Experiment Is Successful

Only recently has the attention of British railroad engineers been directed to the possibility of securing smoother running and reduced maintenance cost by the application of welding to the roadway. At the recent International Railroad Congress a paper on the subject was read by George Ellson, chief engineer of the Southern Railway, one of Britain's four chief railroads. It is interesting to learn that success has attended that road's experiment with welded rails.

The experiment consisted of laying rails 180 ft. long, instead of the usual standard 60-ft. rails, and was prompted by the need for reducing the number of rail joints, the joint being the weakest part of the track owing to the hammering it receives from the wheels of passing trains.

Merstham Quarry tunnel, on the London-Brighton line, is the first main line tunnel in the United Kingdom where welded rails have been used. There has been a very great reduction in the volume of noise as the trains pass through. A tunnel was chosen for the experiment because there is much less variation of temperature, and therefore of rail expansion and contraction, in a tunnel than in the open. It was not possible to weld the rails on location, so the 180-ft. lengths, each weighing 2½ long tons, were conveyed on a train of three cars. Rails were lowered into position by six men with the aid of special appliances.

Merstham Quarry tunnel is approximately 1¼ miles long, and the work of substituting the welded rails for the old on the double track occupied eight days.

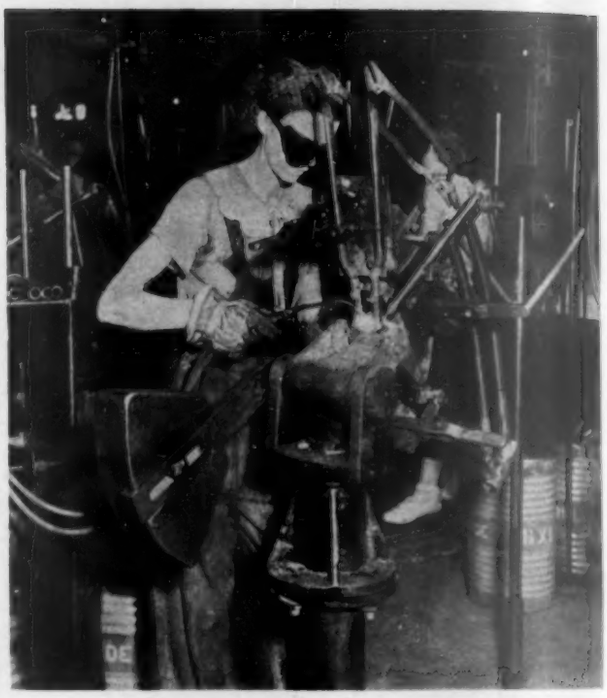
The new rails are comparatively short as welded rails go, as in Germany, the Reichsbahn has welded lengths up to 6,562 feet in tunnels. Moreover, the London Passenger Transport Board, which operates London's electric subway system, recently installed 1,650-ft. rails in certain tunnel sections. These, however, are only intended for the use of light electric trains.

Another of the British main lines, the London and North Eastern Railway, is now experimenting with welded rails 1,260 feet in length. Experiments are also being started by the two other British main lines—Great Western Railway and London, Midland and Scottish Railway. The future of the welded rail appears bright in the United Kingdom.

Production Welding of Bicycle Frames

THE amazing come-back of the bicycle industry in this day of high-powered streamlined automobiles is of interest to engineers and designers who may be considering seamless or welded steel tubing as a structural material. Up to about four years ago, all bicycle manufacturers fabricated the frame of a bicycle by brazing the sections together. One of the first plants to adopt fusion welding in bicycle frame assembly was the Arnold Schwinn & Company plant in Chicago. This concern is one of the largest makers of bicycles in the United States.

In this plant, the frames are made by gas welding pre-formed sections of No. 18 gauge 1-in. welded steel tubing (.07-.08 per cent carbon). The parts are held rigidly in proper relation to each other by means of simple positioning jigs, which are counter-weighted to facilitate easy manipulation by the operator. Three of these welding jigs in a row constitute a production line, each jig being designed to position the frame for a definite welding operation. One big advantage of these fixtures is that they permit all welding in the down-hand position. Ends of tubing are chamfered ready for welding before delivery to the welding department.

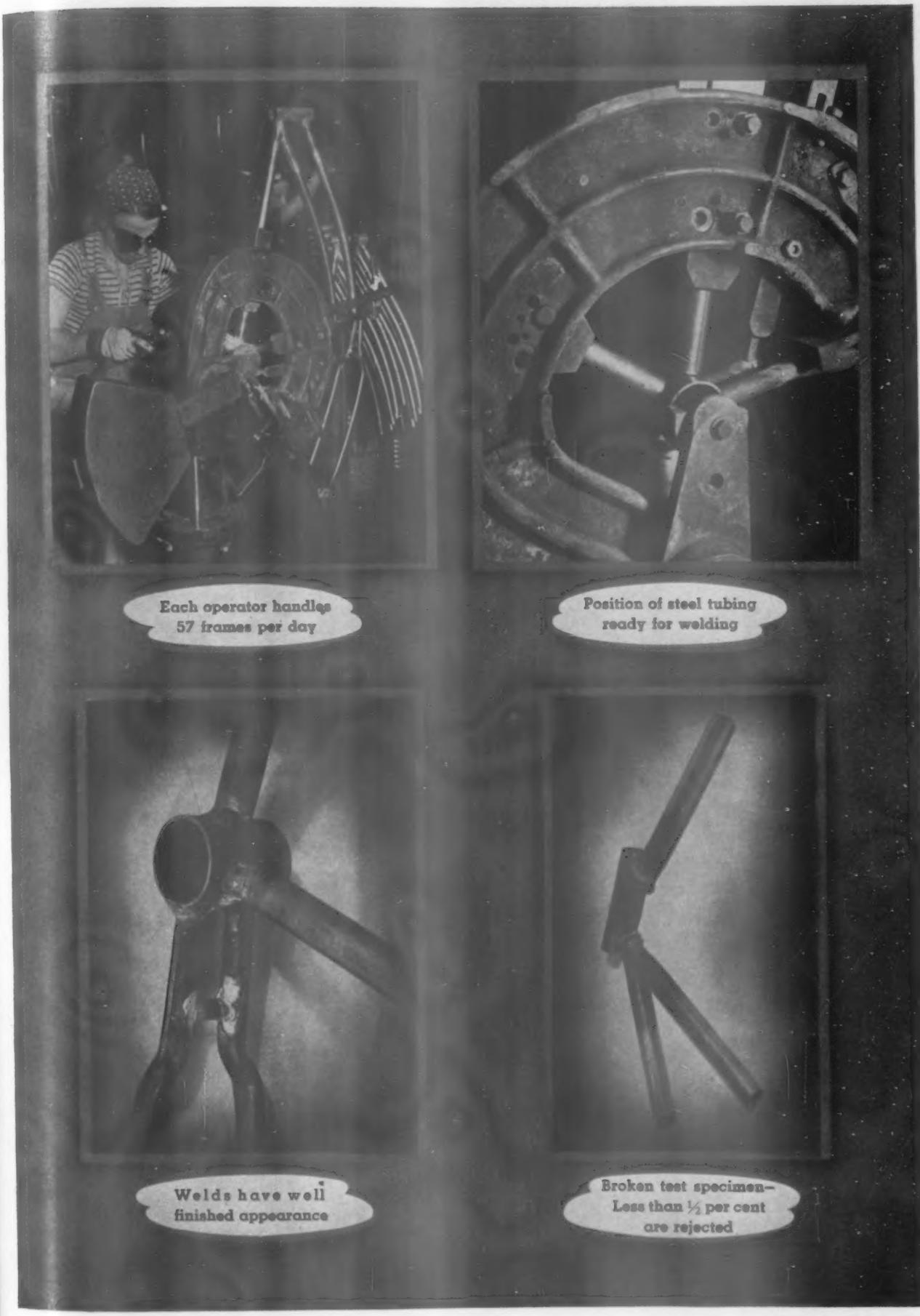


Positioning jigs facilitate gas welding of frames

Rear axle bracket is butt-welded electrically

Overhead distribution of manifolded oxygen and acetylene supply keeps all piping and hose connections out of the operator's way. Welding rod is 1/16-in. mild steel. Blowpipes are small and adjusted for neutral flame. Operators are so skilled that rejected welds are less than ½ of 1 per cent. Tests are made daily, on different operators, to check on the quality of work. A frame is selected at random, sawed in mid-section, and with the aid of tremendous leverage the welded joints are tested to destruction. The break will occur in the tubing adjacent to the fillet, if properly welded. An illustration shows what happens to a good welded joint.

Each frame has 10 gas-welded joints, 2 bronze-welded bracket connections, and two flash-welded joints. The bronze-welded connections are for the rear mud guard. The rear axle bracket is stamped from mild steel and butt welded in a resistance type machine. Welding power consumption is 35 KVA., at 220 volts, 60 cycles.


Each operator handles 57 frames per day
Position of steel tubing ready for welding
Welds have well finished appearance
Broken test specimen—Less than ½ per cent are rejected

Rigid welding standards are enforced because bicycle frames are hand finished to give perfectly symmetrical contours. There must be no uneven surface at a joint, nothing to indicate that the tubing has been welded together. This hand finishing of frames is a most important operation and employs more people than the welding department. Portable grinding, hand filing, soldering for smooth contours and machine polishing, bring the frames to the enameling room in perfect condition.

In the gas welding section each operator handles about 3 welds per frame and about 57 frames in an 8-hr. day. Training period for a "green" operator is about 6 weeks, after which time experience indicates about 99½ per cent perfect work. At the present writing the welding department has 42 operators.

Novel Type of Welded Construction in Plant Addition

In the construction of an addition to its plant in Cleveland, the Lincoln Electric Co. has employed a new type of welded design which utilizes "tree-form" columns recently developed by the Austin Co., Cleveland. The building, two stories high and containing 200,000 sq. ft. of floor space, is of the rigid frame, saw tooth type. Through the elimination of all cross members and trusses, the building attains 100 per cent availability of floor space from floor to floor.

The welded "tree-form" sections were designed for welded construction. It is stated that the cost of using them in any other type of fabrication would be prohibitive. The sections are entirely plate fabricated by arc welding. The components, cut and rolled to proper size and shape, are placed in jigs, clamped, tack welded, then finish welded to standard H-beams in the shop. They provide the main and stud columns of the building.

The same rigid frame construction characterizes a lofty bay, 240 ft. long, 80 ft. wide and 39 ft. high, also situated on the second floor. "Tree-form" columns, each weighing two tons, support simple 65 ft. welded rafters which completely span this bay. These rafters, welded to the columns, support a cement tile roof.

As an example of the speed that was attained in erection, 93 tons was put in place in one 8-hr. day. Erection was begun on July 7 and about 1300 tons was in place by Aug. 2. The erecting job was facilitated by the accuracy of shop fabrication. Shop welded members, consisting of columns, 65-ft. rafters, intermediate rafters, floor beams, girders, lattice frames, roof purlins, etc., lined up perfectly for the temporary bolted field connections.

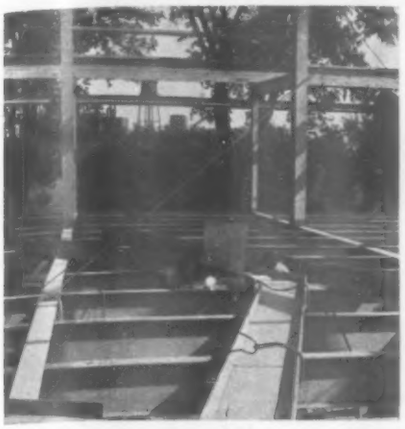
Structural steel weighing 1,314 tons is being welded into one rigid frame

The Lincoln Electric Co. states that erection and welding costs were substantially lower per ton of steel than for previously welded buildings. This was due to efficient design and experience gained in erecting structural steel by welding. A total of 29,600 lineal ft. of welding using over 5½ tons of welding electrode was required. Of this welding footage, 25,000 ft. was for shop fabrication and 4,600 ft. for erection. All of the welding was by the shielded arc process with heavily coated electrodes.

The success attained in this project is deemed to be of particular importance at this time in view of the recognition being given to

"Steel carpenter" is fusing steel plate into a "tree-form" structural section

Joining two sections of 65-ft. roof girder by electric arc welding



welded structures in municipal building codes, as for example the new code in New York City which permits use of welding in building construction for the first time.

Welding of Huge Pipe Tests Stamina of Operator

BY MAYNARD M. SCHUCK

The toughest welding job I ever tackled was on the huge manifold installed by Consolidated Steel for the Metropolitan Water District of southern California. Located three miles from Parker Dam, the manifold houses nine pumps that will draw water from the Colorado River and boost it to a higher level. From there it will flow through the mammoth aqueduct to the Metropolitan District, an incorporation of thirteen cities, including Los Angeles.

The siphon, which is 16 ft. in diameter, is joined to the nine-spout manifold by a ball type of tee-reducer joint. I have welded in some tight, hot places, but that manifold job beats anything I have ever experienced. The entire sweep of country around the place, as far as the human eye can see in every direction, is a barren desert.

A deep excavation had been made in decomposed volcanic and conglomerate rock for the purpose of laying the manifold. Laborers were compelled to work in a sweltering basin where scarcely a breath of air stirred. Each welder was weighted down with the usual leather apron, jacket, and gloves, a few pounds of electrodes, a helmet, and a slag hammer. How the fellows on the day shift stood the severe punishment is beyond my imagination.

I drew the swing shift, but that didn't help much. We had to do all the inside welding. By the time we entered the steel manifold at four o'clock in the afternoon, it had heated clear through from the bright sun. The oppressive air was heavy with fumes and metallic dust. I'm not exaggerating when I say the place was like a bake oven.

As the task of fabrication progressed, the openings in the manifold were gradually closed until only two remained. Ventilation became very poor. A proper type of blower or suction device most likely would have remedied the situation, but the company supplied the best available at the time.

It was a tough climb up the scaffold inside. We had to hang on with one hand and carry a heavy cable and a helmet in the other. Then when I had arranged a heavy plank and was all ready to strike an arc, I sometimes found that I had forgotten something below. Finally, when everything was all set, we started at the top and finished each weld in three passes, two of which were peened for stress relieving. Sweat dripped until it ceased to taste of salt. The chipper nearly tore our ear-drums out doing his peening job. A shower of sparks peppered us in the neck. Smoke was so thick it could be cut with a knife. The heavier welding on the outside was done up-hill by the day crew.

Internal welding of huge water supply pipe was gruelling job

Over 90 per cent of the welding was done by hand, using 3/16 in. and 5/32 in. coated rod. The remainder of the welding was done by automatics in Consolidated's shop. The hand welding requirements were rather stiff. All welders were required to pass the Metropolitan Water District test, which is equivalent to that of the American Petroleum Institute. After the job was completed and all test heads were welded to each of the nine spouts, the entire manifold was given a hydro-static test.

It should be stated that the Gene Wash intake and pumping station near Parker Dam is only a small portion of the entire construction project that is being rushed to completion in order to provide Los Angeles and surrounding cities with a permanent water supply. In addition to the aqueduct, dam, and reservoirs, there will be four other pumping stations similar to the one here described.

The construction engineers who planned the aqueduct found welding to be the most satisfactory, economical method of steel fabrication. Tensile strength tops the 50,000-lb. figure, and the degree of ductility is far greater than will ever be required, in my opinion.

Wages, Hours and Employment in Manufacturing

Average hourly earnings in manufacturing industry increased from 70.7 cents in June to 71.0 cents in July according to the regular monthly survey of the National Industrial Conference Board. A decrease of 2.2% in the average work week, however, resulted in a decline in average weekly earnings.

Since July, 1936, there has been an increase of 16.6% in employment, 17.1% in total man-hours worked, and 34.2% in payroll disbursements. Average hourly earnings in July of this year were 15.1% higher than a year ago and average weekly earnings were 15.0% higher. There has been an increase of only 0.5% in the length of the average work week.

Comparison with conditions in 1929 indicates that there has been improvement in employment, but that manufacturing activity as measured by total man-hours worked has not yet reached the 1929 level. There were 2.8% more workers employed in July, 1937, in the twenty-five industries reporting to the Conference Board than in 1929. Total payroll disbursements exceeded those

of 1929 by 0.2%. Total man-hours on the other hand were 16.4% less than eight years ago. Average hourly earnings are now 20.3% higher than in 1929, but the average work week is 18.6% shorter. Weekly earnings are 2.5% lower than in 1929 as a result of the shorter work week, but the purchasing power of those weekly earnings is 9.8% above the 1929 level.

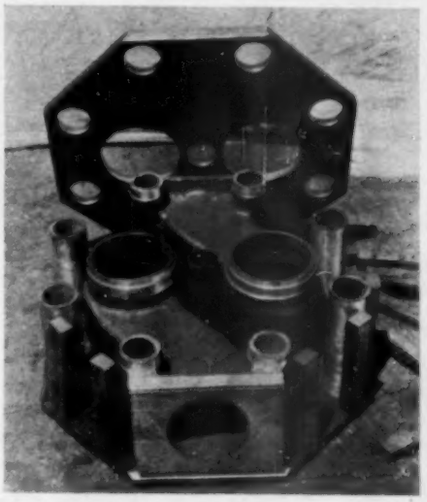
Diesel Cylinder Heads Fabricated From Steel

Southern Pacific Golden Gate Ferries, Ltd. operating the largest fleet of ferry boats on San Francisco Bay, are among the first to apply the economy and versatility of the arc-welding process to the fabrication of diesel engine cylinder heads.

The cracking of the cast iron heads on one type of diesel engine, of which the company has twenty-four in service, became a very grave problem. After five years' operation the company experienced 100 percent replacement of cylinder heads. Efforts were made to repair cracked heads, but a very small percentage of these repairs were successful, owing to methods used.

Finally, A. C. Piercy, maintenance superintendent, conceived the idea of fabricating the heads completely of steel by the arc-welding process. All parts of the heads are made of steel plates or tubes except the intake and exhaust passages which are steel castings. The illustrations give a clear picture of the construction features. The bottom plate is 1 inch thick and top plate ¾ inch. In designing the heads it was necessary, of course, to make the dimensions the same as the original heads so as to fit the existing manifolds, valves, etc.

The welded heads are lighter than the cast iron ones, the water spaces are larger and smoother and it is believed they will not crack. All welds are on the outside away from the action of the sea water in the water spaces. The interior of these water spaces is protected from the action of the cooling water by a non-corrosive coating which has proved very satisfactory.



All parts made of steel plates or tubes except intake and exhaust passages

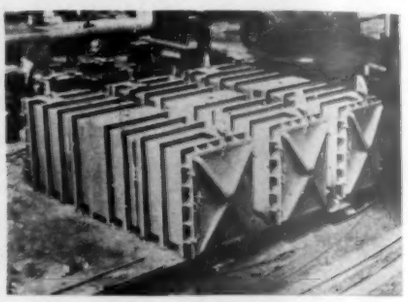
Welded heads are lighter than cast-iron — water spaces are larger and smoother

Four heads have now been completed and others are in the process of fabrication. The first one installed several months ago has been entirely satisfactory. The operators now believe that these fabricated heads are the solution of their head problems.

All work was done in the shops of the Southern Pacific Golden Gate Ferries, Ltd. under the direct supervision of Mr. F. D. Meagher, shop foreman. The welding was performed by Mr. Philip Vorheis using General Electric Type W-22 and W-23 electrodes and General Electric arc-welding machines.

Vacuum Fumigation Chambers Arc Welded

In the Guardite process of vacuum fumigation for preventing insect infestation in food products, tobacco, furs, paper documents, etc., use is made of welded construction to obtain strength at economical cost. The vacuum chamber is made rectangular in shape so that packages of rectangular shape will fit into it with a minimum of waste space.

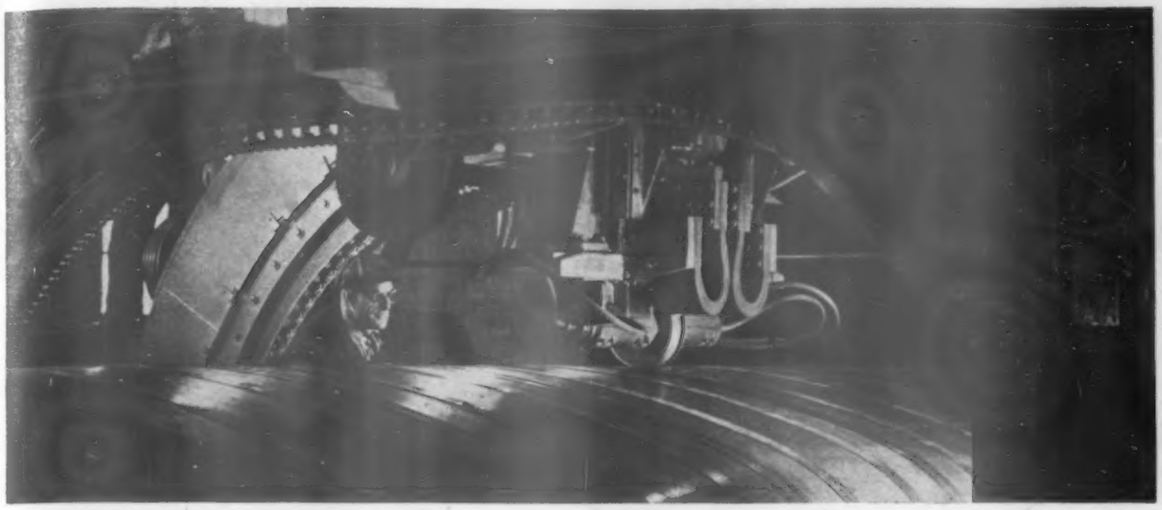


Welded steel fumigation chambers must withstand air pressure against a 29-in. vacuum inside

These fumigating chambers are designed for a 29-in. vacuum, the supporting truss work being located on the outside of the structure. These welded chambers were fabricated in the Chicago plant of Chicago Bridge & Iron Co.

A standard Guardite unit comprises a gas accumulator, rectangular treating chamber, vacuum pump, inter-connecting piping, control and handling equipment. Product to be treated is placed in the chamber. The gasket equipped door is closed and the vacuum pump is started. When a 29-in. vacuum is reached, the fumigating gas from the accumulator is admitted to the treating chamber. After a definite length of time, the toxic gas is exhausted and the merchandise is given an air-wash by circulating fresh air through the chamber, after which it is taken out and placed in clean storage.

Welded construction is particularly advantageous for the vacuum chamber, because it makes the chamber leak-proof. A vacuum chamber design is used because the fumigant penetrates the merchandise more quickly and more thoroughly.



Welding passenger car roofs

Pullman-Standard Active In Welding Developments

Will be prepared to build welded box cars on production basis early in 1938

A STEADILY increasing application of welding is being made by Pullman-Standard Car Manufacturing Co. in the construction of freight and passenger cars and parts at their various plants. A number of their railroad equipment products are described in detail in this article.

The management of Pullman-Standard feels that welding offers many bright prospects for the future of railroad car construction and early in 1938 they expect to be prepared to build welded box cars on a production basis.

Two welded box cars and one welded refrigerator car, already built at weight savings of five tons and more per car, have led to calculations which produce these astonishing figures: five tons per car would save approximately 54,000 ton-miles, per car, per year. If all of the 730,000 box cars in service were replaced with this type of car, the saving per year would be 39,000,000,000 ton-miles. These figures are worthy of the serious consideration of every railroad man in the United States.

Pullman-Standard is equipped to weld all types of alloys, including aluminum, stainless steel and the low alloy steels, such as Cor-Ten, RDS, Hi-steel, etc., and they use these materials where they are indicated to satisfy strength requirements and for economy. This equipment builder has determined that for car structures, aluminum produces the lightest car; the low alloy steels, the next lightest design; and stainless steel the heaviest. Their aluminum structures are riveted, although spot-welding is used for a good deal of the aluminum inside finish, which is applied to the shell. The low alloys are welded throughout the structure.

Pullman-Standard claims that when stainless steel is used, because of its lower modulus of elasticity, slightly heavier material has to be used in the framing members to produce structures of strength equal to

Table 1—Summary of Welded Fabrication at Pullman-Standard Plants

283—Passenger Car Structures
- 5—All Welded Hopper Cars
- 2—Welded Box Cars
- 1—Welded Freight Refrigerator Car

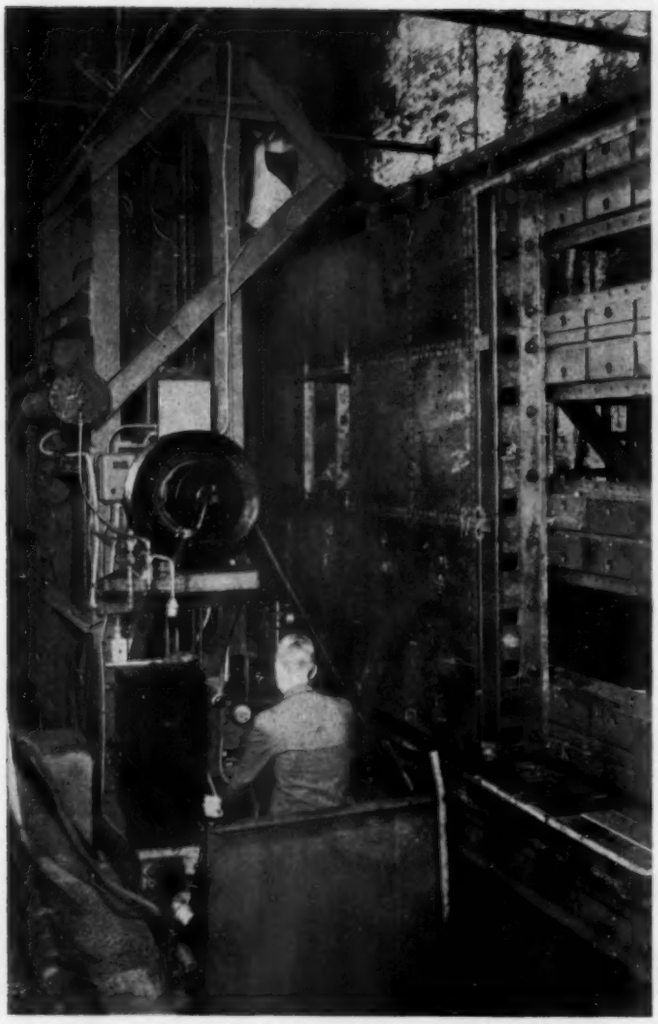
150 Welded Underframes For Box Cars

100—Welded Underframes For Passenger Refrigerator Cars

100—Welded Roofs For Passenger Refrigerator Cars

200—Car Sets of Welded Side Doors For Box Cars

750—Car Sets of Welded Draft Sills For Various Types Of Freight Cars



Welding passenger car sides

that obtained with the low alloys. Furthermore it is stated that the cost of the low alloys makes the finished article less expensive and therefore more commercial. While stainless steel has a higher tensile strength, this equipment builder claims that the full advantage of it is not available to the designer because of its lower modulus of elasticity.

An indication of the extensive use of welding by Pullman-Standard is shown in Table 1 which lists the jobs completed and under construction.

The outstanding advantages of all-welded cars are:

(1) Light Weight
(2) Low Maintenance Cost
(3) Smooth Outer Body Surface
(4) High Thermal Efficiency For Refrigerator Cars
(5) Adequate Strength

Roomette Sleeping Cars

Pullman's latest introduction to the transportation field, the "Roomette" car is of particular interest to welding engineers, because of the extensive use of welding in its fabrication. Before describing the welding, it is in order to outline some of the design features, which make this "Roomette" car outstanding. The first car of this type was exhibited at the Atlantic City convention of the Association of American Railroads, June 16-23. It is stated that this new car was the "hit" of the railway exhibits.

Briefly, the "Roomette" car has 18 completely enclosed private rooms, each containing a bed, which during the day can be folded into the end wall, leaving a comfortable sofa for lounging or dressing. This feature permits the use of the entire room space whenever desired. Other "Roomette" comfort features are: individual regulation of ventilation, heat and light, complete toilet facilities, and individual clothes locker. Many of these new cars are now being built to go into service this Fall.

Passenger Car Center Sill Construction

One of the interesting welding features illustrated is the construction of the center sill of the underframe. The center sill can be looked upon as the "backbone" of the car. Briefly, the center sill is fabricated from two Association of American Railroad standard Z-bar sections, seam-welded electrically by means of a specially developed automatic machine. This device has two small guide wheels which straddle the seam to be welded. Welding wire is fed at a constant speed from an overhead reel, and when the wire reaches the seam, it is melted by the welding current. A powdered flux is distributed ahead of the electrode wire to expedite the welding and protect it from atmospheric gases. No arc is visible. One of the novel features of this machine is a vacuum cleaner, so to speak, which sucks up the unused welding flux into a container so that it can be used again. One of the illustrations shows the operator manipulating this vacuum cleaner.

Passenger Car Side Sheets Welded Vertically

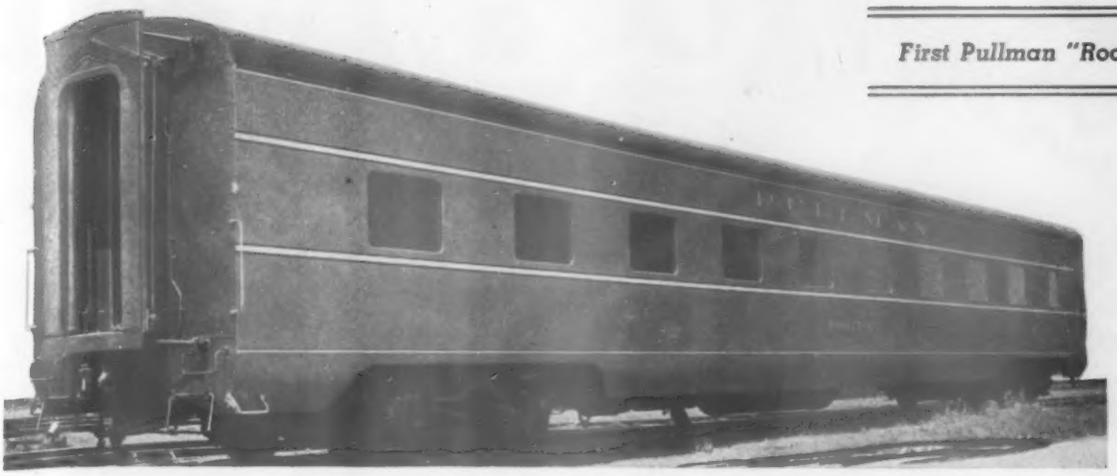
Car sides illustrated are of the flat girder type. An especially designed electric spot welder has been combined with long vertical side-assembly jigs to enable the operator, after fitting and arc welding of side frame has taken place, to spot weld the side sheets to the frame in the vertical position as on the finished car. Each side is assembled as a rigid unit from the bottom side sill to the top side plate, sheets being attached to the frame by approximately 6,000 spot welds. A feature of this new construction is the smooth outer surface of the car side, the welding spots not being discernable when the car exterior is painted.

Special Welding Machines

The spot welding machines used by Pullman-Standard for roof and sides employ the "series" principle of spot welding, that is, both welding electrodes are placed on the same side of the plate with a copper backup bar behind the plate to resist the pressure of the electrodes, and also to conduct the current on the reverse side of the plate from one electrode to the other. The spot welder used for fabricating the sides is capable of welding vertical or horizontal rows of spots, automatically spaced. The operator starts the machine, then stands by to watch the welding operation and stops it when the end of the row is reached.

Adjustment of Electrode Spacing

Welding electrodes are mounted on a slide which permits adjustment of spacing between the two electrodes. For this purpose a ratchet drive device is employed, spacing being adjustable from one to five inches in ½-in. steps by means of a lever.



First Pullman "Roomette" car

When welding vertically, the welding unit is moved up or down by means of a link chain. When welding horizontally, the entire carriage is moved along a track. A chain rack is used for driving the carriage to eliminate the slippage that would occur if only the traction of the wheels upon the rails was relied upon to overcome the momentum of carriage movement.

Power to the welding transformer is delivered to the carriage by means of two trolley wires in contact with double trolley shoes on each wire. By using two shoes in parallel on each wire a good contact is assured.

Electronic Timer

The time of welding current is accurately controlled by an electronic relay, which in turn controls a magnetic contactor. The feature of this electronic timer is its ability to energize the magnetic contactor and the welding electrodes at precisely the same point every time in the A-C. voltage wave. This saves wear and tear on the electrodes. Adjustment of the welding time is effected by means of a dial switch in the control cabinet.

Car Roofs Spot-Welded By Roller-Type Machine

Pullman-Standard is also employing a special spot welding machine for mass production of welded steel car roofs. This very ingenious welding machine operates on the "series welding" principle and utilizes two rollers to conduct the welding current into the work. These rollers remain in contact with the work and roll along, under pressure, spot welding the seam. Welding current is interrupted at pre-determined intervals to produce spot welds spaced at the desired distance. This clever automatic welder is mounted on two heavy I-beams bent to form the same contour as the roof of the car. The welding unit or "head" is driven along these curved beams by means of a motor and pinion engaging a chain rack. Welding pressure on the rollers is provided by two independently-controlled air cylinders.

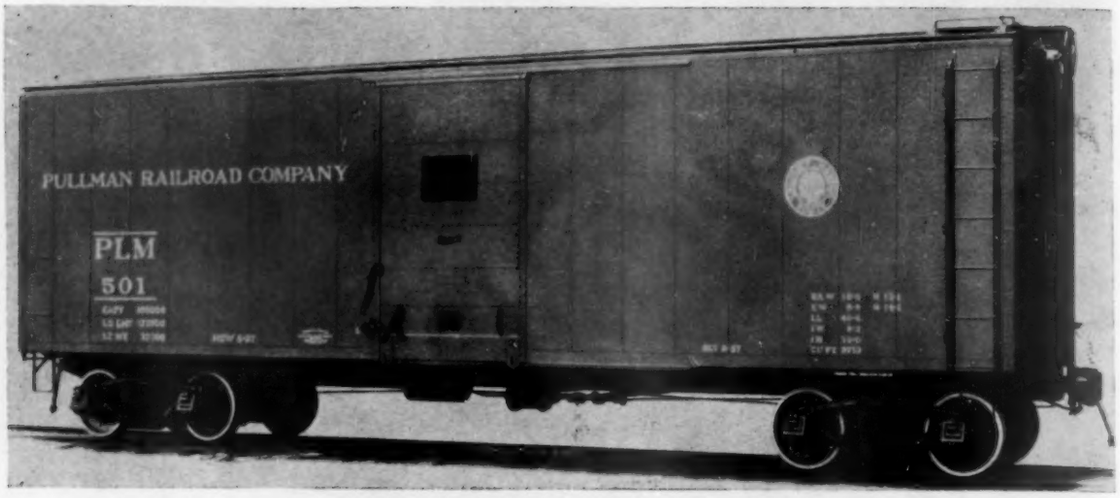
Timing of welding current is by means of an electronic relay, similarly to the control used for side plate welding. It is stated that this type of control is a most accurate method for controlling the timing of the welding current. The length of time that the current is off determines spacing between welds, because the rollers move over the car roof at a constant rate of speed.

Definition of Spot Welding

The process of spot welding consists of passing a current of several thousand amperes at a relatively low voltage through two or more pieces of metal, while applying mechanical pressure at the same time. The pressure is applied by the same electrodes that conduct the current to the work. The enormous current rapidly heats the metal at the electrodes to a welding temperature. The pressure applied forces the plastic metal together. The weld cools as soon as the current is turned off and the pressure is then released.

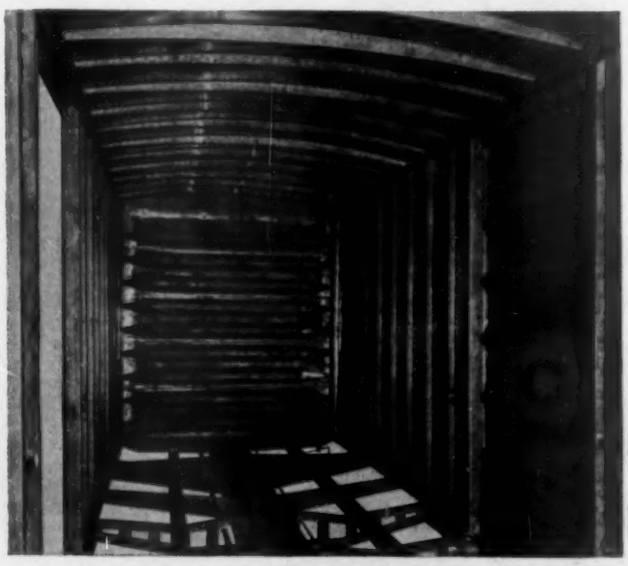
With the "series" process used on these welding machines, two electrodes contact the work on the same side. The welding current travels

Welding passenger car center sills



Second Pullman light-weight box car

from one of the electrodes through the work to the copper face of the jig, through the jig, to the other electrode. Thus two welds are made at the same time.



Structural interior of welded box car

Making Settings on Machine

To determine the settings to be used in spot welding of car sides or roofs, the following factors must be taken into consideration

1. Kind of material
2. Thickness of material
3. Size of spot desired
4. Spacing of welds desired
5. Metallurgical effects upon weld metals
6. Buckling of panels
7. Area of material in magnetic field of welding current
8. Variations in fabrication
9. Variations in surface condition
10. Maintenance of electrodes
11. Appearance of welds

A setting must be chosen that gives the best possible results when all the factors are considered. The four settings to be determined are:

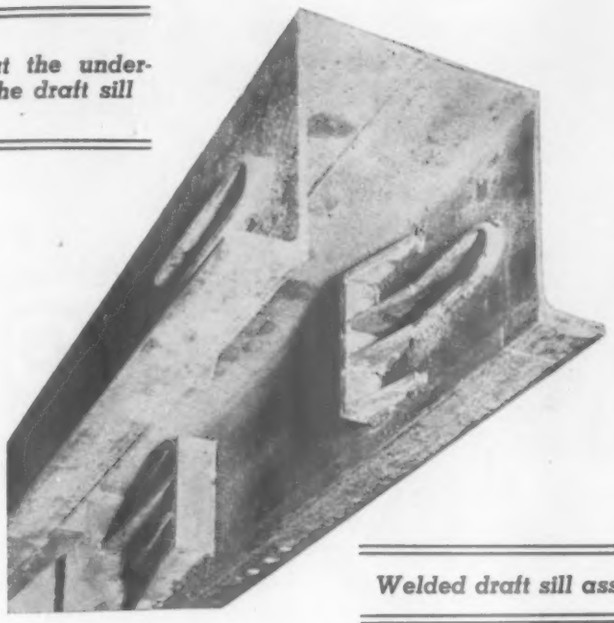
1. Welding current
2. Welding time
3. Welding pressure
4. Size and shape of electrodes

To determine the best setting that will satisfy all of the conditions enumerated above, samples are made and tested over a wide range of settings. Current is varied from minimum to maximum for various settings of time, pressure, and electrode size. Tests are made to determine strength of welds, hardness of welds, and buckling of panels. The strength tests consist of tensile, shear, shock, and fatigue tests. After all the results of these tests are reviewed, a setting is chosen that will best satisfy all conditions.

The final samples that are made and tested, are full size actual sections of the car roofs and side. After examination for appearance, these samples are torn apart to check machine settings. The settings chosen are made so as to take care of commercial variations that occur in the

Welded bolster center filler

Looking at the underside of the draft sill



Welded draft sill assembly

assembling and manufacture of material.

Keeping Settings Constant

After the machine settings are made they are kept constant. The current is kept constant by keeping the line voltage constant. A special line for these welders is run direct to the power house to avoid any fluctuations due to other equipment on the line. At the power house automatic regulators keep the line voltage constant.

Air pressure is kept constant by means of an air regulator. The pressure that is used is below the regular line pressure, so that line variations will have no effect on the welding pressure.

The welding time is kept constant by means of electronic controls previously described. These controls always measure out the same length of welding time.

How Settings Are Checked

In order that a positive knowledge may be had that all machine settings are remaining constant special instruments are provided. A voltage meter indicates the line voltage to the welding machine thereby insuring that the welding current is remaining constant.

A cathode ray oscilloscope is used to measure current and voltage at any part of the welding circuit desired. By this means any transients, that may exist in the welding current, are observed. This instrument is used to calibrate and measure the welding currents.

An air pressure gauge is provided for checking the welding pressure.

The welding electrodes are checked for size, by means of a templet, before being used, and are changed frequently so that "mushrooming" will not change the size of the electrode. Only machined electrodes are used; the operator is not permitted to dress an electrode with a file.

Frequency of Checking Settings

All settings are checked every morning before starting work. The operator keeps his eye on the gauges and meters he is provided with throughout the day. Checks of timing are made many times during the day.

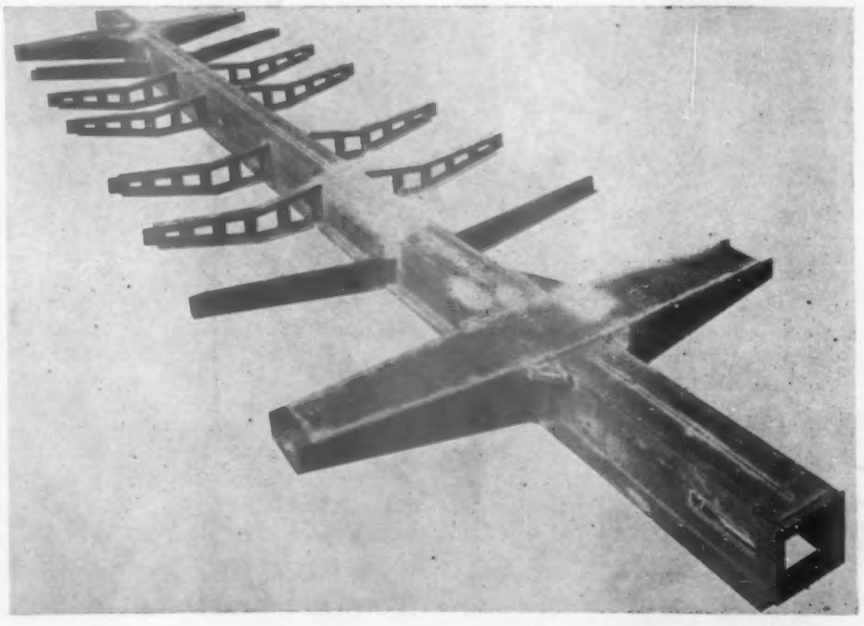
In roof machine operations an actual carline is welded to two full length strips of the same gauge as the roof sheet. The sheets are torn from the carline and the welds inspected by a supervisor before proceeding with the next roof. On the side machine a sample post and side-sheet section is welded and this assembly is then torn apart and checked before proceeding with other car sides.

Welded Steel Box Cars Accomplish Weight Savings

In 1935 Pullman-Standard built a welded high-tensile steel box car with a weight saving of five tons compared with conventional types of cars. This car has been in service over 25,000 miles with no repair cost. Recent inspection shows the car to be in first-class condition. This substantial saving in dead weight was made possible by extensive use of welding and is available for increased load-carrying capacity. Based on length of seam, fabrication of this car involved 22 per cent arc welding, 54 per cent spot welding and 24 per cent riveting. The side sheets were of corrosion-resistant steel assembled by spot welding on a special horizontal jig. Only at the corners of the car was riveting employed. The roof sheets were joined to each other and to the carlines by spot welding, but the roof assembly as a unit was secured to the car by riveting. Electric arc welding was employed for joining heavier sheets and shapes.

Early this year Pullman-Standard built a second 50-ton light weight all-welded high-tensile steel box car, which was 10,000 pounds lighter in weight than the standard A.A.R. car weighing at least 45,300 lbs. The weight saving was 27 per cent. Ratio of maximum revenue load to the total allowable weight on the rails was 79 per cent. This car represented Pullman-Standard's latest contribution to light-weight freight equipment.

Welded freight car underframe



Welded refrigerator car

Weight saving was made possible by the use of high-tensile alloy steels and welded construction.

In building this car Pullman-Standard employed the latest developments in welding practice, using special machines to assure uniformly high quality welds at high production rates. The general merit of the welded design was demonstrated by the first welded alloy-steel car built in 1935.

Arc welding was employed in the assembly of side frames, ends and underframes. All of these welds were of the butt type, the use of the single fillet weld in this construction being avoided.

The underframe of the car was built of high-tensile alloy steel completely welded, as shown in an illustration. Z-section center sills were used, the two sections being welded together at the top center line, as is customary with this type of sill. The cross sectional area, however, was reduced slightly from that of the standard A.A.R. center sill, which is made of low-carbon open-hearth steel, and could have been reduced still more, with equivalent strength, except for difficulty in rolling the desired thin section of center sill in high-tensile steel. The center sill, therefore, possesses greater impact or buffing strength than the standard A.A.R. center sill.

Purdue University Tests

The bolster is a box section welded to the center sill member and reinforced by gussets so that, both as a load-carrying member and as an impact-resisting member, this bolster produces sufficient strength to tie-in the side-framing construction and provides the maximum resistance to shifting of the underframe with respect to the super-structure under extreme impact.

The inverted view of this underframe shows clearly the center filler, the welded back stop and draft lugs, as well as the striking member, which are Pullman-Standard developments that have been tested to destruction at Purdue University *and show strength considerably in excess of the standard cast-steel and riveted structures.* These constructions are covered by patents pending in which a number of claims have been allowed.

The construction at the bottom of the bolster around the center plate in connection with the center filler is a prolongation of the back-stop section, and the method of taking care of compressive stresses at the center plate is by means of Z-bar sections which are clearly illustrated.

More Weight Reduction

Cross-ties, applied as shown and welded to the center sill structure, have been reduced in weight to correspond to the stresses imposed. It will be noted that the cross-bearers are of the built-up welded type, taking maximum advantage of the top and bottom chord members with proper spacing of stiffeners for uniting these sections.

An unusual feature was the omission of diagonal braces and the substitution of a reinforced gusset, welded to the center sill, to the end sill and to the side sill member, thus forming a unit connection between these members, which distributes the stresses between the center sill and the sides, without concentration or localization.

After the side sheets with proper reinforcements had been welded together, they were spot welded to the side sill and side plate members and to the door post, with proper auxiliary gussets, or connecting members, to develop the full strength of the structure.

The Z-shape carlines are a part of the roof sheets, being formed integral with the sheets. Where necessary, these carlines were reinforced to take care of stresses imposed and were spot-welded to the upper horizontal leg of the side plate member and welded to the carline supporting members, which were in turn welded to the side plate at the ends of the carline. In addition, the brackets supporting the running boards were spot-welded to the roof sheets.

The A.A.R. corrugated-type car end was employed. All the sheets except the extreme top were ⅛ in. thick of high-tensile alloy steel and the end plate member was spot-welded to the top section of the corrugated end. The special feature of this end is the corner reinforcing member, which forms, with the corrugated end, a box section post at each corner which was fastened to the side framing by rivets in double shear. Tests of this type of construction have shown a lack of twisting at this position, which is one of the causes of end distortion or bulging in other cars.

Except for safety appliance rivets, the rivets mentioned comprised the only rivets used. Rivets were employed at the corners to facilitate attachment of the steel end assembly to the side wall end panels.

Another feature was the absence of pipe clamps. The brake pipe, wherever good practice permitted, was welded to the structure, in line with the procedure successfully followed by Pullman-Standard for some time.

Welded Steel Refrigerator Car

Early last year Pullman-Standard built a light weight welded high tensile steel refrigerator car. This car weighs 44,300 pounds, or 10,000 to

Welded hopper car

13,000 pounds less than the conventional type of wood refrigerator car of 40-ton capacity. This car has been operated for about 40,000 miles with only running repairs. An important advantage of the steel car is the reduction of repair costs and elimination of necessity for periodic rebuilding.

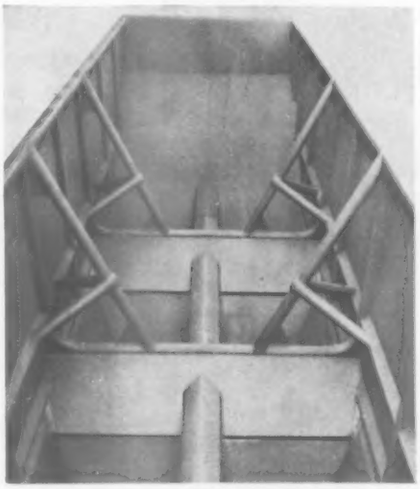
Both arc welding and spot welding were employed in the construction of the light-weight refrigerator car. A small amount of riveted construction was used, but welding was employed almost exclusively in fabricating the unit assemblies. An indication of the increased load carrying capacity of this newer type car can be had by considering the ratio of A.A.R. load limit to maximum allowable rail load. For this new car, the ratio is 67.5 per cent, whereas with ordinary wood refrigerator cars, the ratio of maximum revenue load to maximum rail load is only about 59 per cent.

Welded Center Sill

The center sill of this car is of the new A.A.R. Z-section type, but with web and flanges reduced slightly in thickness. The two Z-sections were joined by welding continuously along their entire length at the junction of the top flanges. The bolster center fillers, draft lugs and striker were built up integral with the center sills by the proper welding of rolled plates and bars. Details of this construction are shown in one of the illustrations.

The body bolsters, made of 5/16-in. plates, comprise four taper box-section pressings, per bolster, welded continuously along the top and bottom center seams and also welded to the center sills. There are four cross bearers per car, each consisting of two 6-in. I-beam sections and a 5-in. by 3/16-in. bottom cover plate. Two floor beams, made of ⅛-in. pressed pans and four diagonal braces, made of 10-in. by ⅛-in. plates, were applied to the underframe by welding, the latter serving to stiffen and strengthen the underframe ends. The body center plates are drop forged bowls of A.A.R. contour welded to a ⅝-in. base plate which is in turn securely welded to the center sill. The body side bearings are arc-welded assemblies of rolled plates and bars provided with wear plates of 3-in. by ¼-in. spring steel.

The side plates and side sills consist primarily of 3-in., 4.99 lb., Z-sections. Twenty-four side posts are provided per car, being made of A.A.R. Z-27 section shapes modified so as to weigh 3-lb. per ft. The door posts are 2½-in. angles welded in place, and the corner posts are a



Interior of welded hopper car

novel box-section design, built up of two ⅛-in. plates, the outer portion being a pressed angle and the inner part a diagonal pressing welded to the outer edges of the angle and tying them together. The end sills are rolled angles and the end posts are ⅛-in. pressed channels flanged to bear against the end sheets and welded to the end plate and the end sill.

All side and end sheets were made of .05-in. high-tensile, corrosion-resisting steel pressed with ⅜-in. deep horizontal corrugations to give the sheathing stiffness and relieve what would otherwise be a flat exterior surface. The side sheets were spot-welded to the side posts, plate and sill, the only rivets used being those at the corner post seams. The end sheets, made in two pieces with a welded horizontal center seam were completely applied by spot welding.

Carlines used in the roof construction consist of ⅛-in. plate pressed to a Z-shape with a 1¾-in. top flange curved to follow the contour of the roof and flared to 6 in. at the side for connection to the side plate. The ends of the carlines were flanged to hook over the side-plate angle and were spot-welded to it. Twelve roof sheets, made of .05-in. steel, are butted on the carlines and have a ⅜-in. flange extending down over the side-plate angle. Each roof sheet has three corrugations ½ in. deep extending from side to side of the car and was spot-welded to the carline, side plate and, in the case of roof end sheets, to the end plate.

Welded Hopper Cars

The first all-welded cars built by Pullman-Standard were 5 hopper cars, 70-ton capacity, built for the Chicago Great Western in 1931. These cars are in service every day and have already seen more than six years of rugged service, and recent inspection indicates that welded fabrication is able to withstand heavy-duty railroad service. Another important point is their resistance to corrosion even though they were built of ordinary steel—not corrosion resistant. Corrosion commonly develops with riveted joints in steel hopper cars.

This C.G.W. car weighed 45,900 pounds light, or 10,500 lbs. less than the typical 70-ton hopper car of recent riveted design. In other words, weight was reduced 18.6%; cubical capacity was increased 3.1%. In fact, these 70-ton hopper cars weighed about the same as a standard 50-ton

car of riveted construction. This meant that the welded car provided 20 tons additional coal carrying capacity at no greater transportation expense for movement of dead weight.

These five C.G.W. hopper cars were of the conventional three-hopper type, but the body design was a distinct innovation, because no cars had been previously built with welded construction. The entire body of each car, including the one piece welded tubular steel center sill was assembled by welding. The only rivets used were those for fastening safety appliances, draft-gear supports, door hooks, and other parts which commonly are subjected to breakage or periodic removal. Pipe joints were made by welding and piping was attached to the car body by means of welding.

Gas and Arc Welding Used

In building these C.G.W. hopper cars, both the oxy-acetylene and arc welding processes were used. On the heavier sections, the gas welding process was used; on light sheets the arc method was employed.

Total lineal feet of welding on these cars was approximately 1,500 ft. per car, of which 56 per cent was handled by the gas process and 44 per cent by the electric arc. The table below lists the parts which were gas welded:

Center sill and attaching parts
Body bolster and all attaching parts, including side and floor sheets
All pipe cross-ridge
Lower end construction
Floor sheets, except where joined to the side and end construction
All pipe joints and pipe anchorage

Arc welding was employed in fabricating the following parts:

All side sheet construction
All upper end construction
All dump doors

Pullman-Standard made extensive tests before starting actual construction of these hopper cars to determine relative efficiency and costs of various types of welded fabrication and assembly of car parts. Welding operators were required to submit test specimen welds as a check on the quality of their work. In addition all welds were hammer tested during fabrication for the purpose of distributing local stresses and to permit correction and reinforcement of any welds which gave indications of weakness.

All Members Rigidly Connected

In the C.G.W. welded hopper car all members were rigidly connected so that the underframe and superstructure act as a unit in resisting draft, buffing and load stresses. Pressed shapes, with large radii at the corners, were used, these shapes lending themselves to the welded construction much better than the usual structural shapes, and having the additional advantage of being light in weight. When welded to the sheets, they formed box sections of greater strength, per unit of weight, than the usual structural shapes used in riveted cars.

Flanges were largely omitted, not being required for the application of rivets, thereby eliminating overlapping areas of metal. The stakes were placed inside the car and the side sheets brought out to the line of the riveted car to give maximum capacity. The car was designed to be self-clearing in every respect, the absence of rivets contributing effectively to this feature. All points in the coal space were made with continuous welds so that there were no openings to permit the entrance of moisture and dirt and promote corrosion.

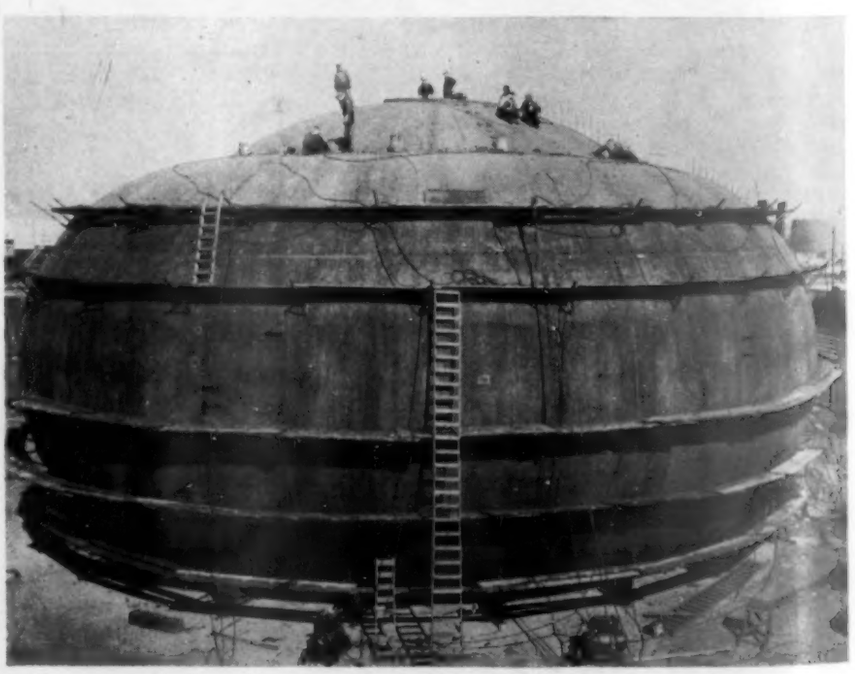
The body bolster was built up with a bottom cover plate and a web plate with proper flanges at the top for supporting the floor sheets. The sides were made of two sheets of different thicknesses, joined with a continuous butt weld lengthwise of the car.

Huge All-Welded Gasoline Storage Tank

As part of an extensive modernization program, the Sinclair Refining Company, East Chicago, Ind., has completed the construction of the first of several new type gasoline storage tanks. Built in the shape of a huge steel "tomato," this tank was completely fabricated by arc welding. An idea of the amount of welding involved can be gained from the fact that the tank is 92 ft. in diameter and 47 ft., 6 in. high, with a capacity of 40,000 barrels of casing-head gasoline. A large part of the welding was accomplished with General Electric single-operator arc-welding sets.

One of the most important considerations in determining the shape of the new tank, as well as the method of fabrication, was the fact that the structure, when completed, would be subjected to a working pressure of 15 pounds per square inch. Unless high pressure is maintained within the storage tank, the gasoline will boil out. This type of tank was chosen because it permits the use of much greater internal pressures than the conventional type tank will withstand. Upon completion, the new tank was tested with a pressure of 17 pounds per square inch and only one leak was discovered. This was easily repaired and the company states that it is completely satisfied with the arc-welding method of construction.

Arc-welded fabrication was employed on this 40,000 barrel gasoline storage tank



Pump Building Offers Many Welding Opportunities

By E. L. MATHY

First Vice-President, Victor Equipment Co., San Francisco, Calif.

AS MANUFACTURERS of welding and cutting equipment our company avails itself, quite naturally, of all of the advantages and economies offered by the welding process, when designing and manufacturing the various pumps produced by our Kimball - Krogh Pump Division.

Frequently it is a matter of weight reduction. Occasionally a special pump design may suggest the elimination of patterns and castings to speed up the job, but essentially we are prompted to use welding and cutting because we believe it will achieve greater sturdiness.

Even though our Kimball-Krogh Pump Division maintains its own pattern shop and is prepared to produce both wood and metal patterns, many of our pumps are of special design to meet particular conditions which do not recur with sufficient frequency to justify the manufacture and storage of costly patterns.

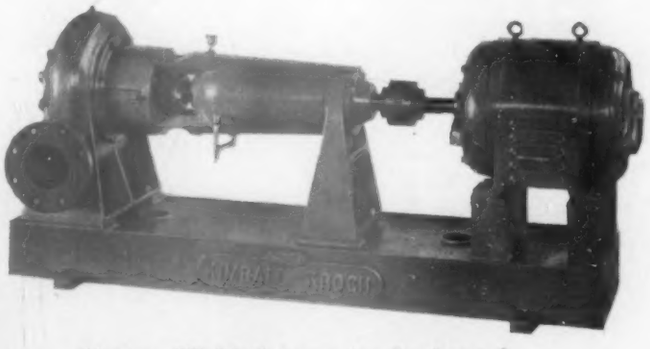
Recently, for instance, we were called upon to produce two large capacity propeller pumps to take care of drainage of approximately 12,000 acres of land at Ryer Island, Calif. The total pumping capacity of this duplex plant is 22,500 gal. per min. and requires two motors of 125 hp. We manufactured the motor bases, pump columns, discharge heads and strainer baskets quickly and economically by the use of a cutting torch and arc-welding equipment.

Many of our horizontal pumps, such as horizontal sewage disposal pumps, sand and gravel pumps, sludge pumps, etc., are provided with all-welded steel bases upon which are mounted motor and pump assemblies. Some of these gravel pumps are exceedingly large and the enormous quantities of rock and gravel they handle per day require maximum strength with minimum structural weight.

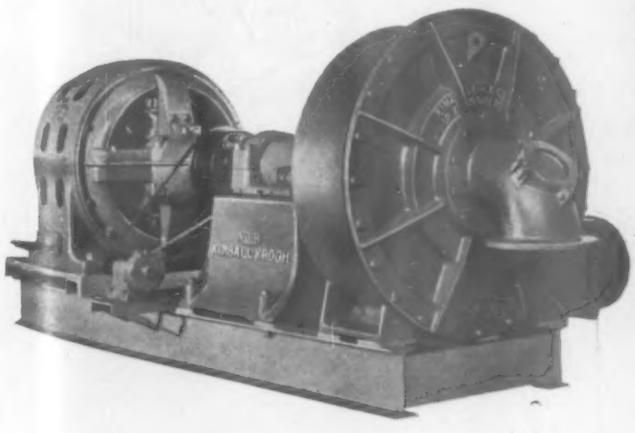
In the installation of deep well turbine pumps for the agricultural market, mobile equipments are of great advantage and we have several of these of all-welded construction.

On certain types of pumps it is occasionally of advantage to cover impellers and pump linings with suitable hard-surfacing materials or to repair them with the arc. Pitted and damaged casings can frequently be reconditioned satisfactorily when deep-well turbine pumps are sent to our various shops for overhauling.

It is hard to visualize how a modern pump manufacturer can get along without adequate gas and electric welding and cutting equipment. It is amazing how many design improvements and simplifications suggest themselves when adequate advantage is taken of the possibilities



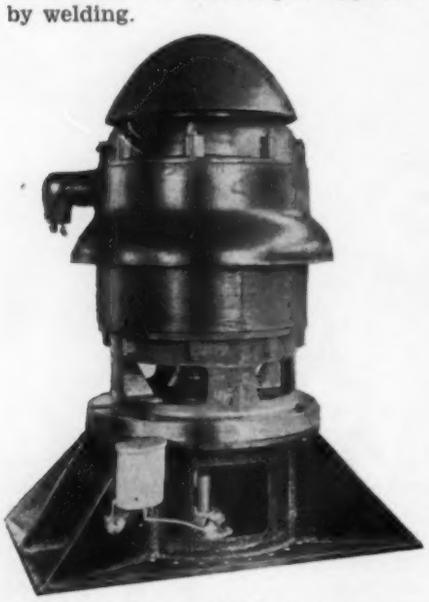
Above—Welded base for horizontal sewage pump



Left—Welded base and supporting brackets for 250-h.p. gravel pump

of these processes. We are intimately connected with the welding industry, and are constantly confronted with new application opportunities. Such discoveries make us appreciate that welding is still far from realizing its full potential development.

Under certain conditions only a limited number of specific types of pumps or pump sizes may be demanded in which case the cost and maintenance of patterns and the creation of castings would be more costly or require more time than fabrication out of steel plates, joined by welding.



Welded base of low-head propeller pump

Under other conditions standard cast elbow sections may not entirely meet existing pipe line angles. On the other hand welded elbow sections will permit any angular deviation not feasible by using standard patterns.

There are, on the other hand, also occasions where certain pump types or parts can actually be produced, in mass production, more economically by the application of welding than the utilization of castings. This is particularly true when consideration is given to transportation costs into foreign countries.

Where a structural shape is sufficiently standardized to warrent sufficient quantities of castings, these usually prove most economical, but the production of pumps for a wide variety of applications and in the many varying sizes needed, does not frequently call for quantity duplication.

Certain small capacity pumps can be considered mass production products, but we are confining ourselves to a great extent, to the production of large capacity pumps for the agricultural, industrial and mining markets.

Training Men to Make Good Welders

Reclamation has long been recognized as one of the important services rendered by the welder. The Division of Rehabilitation, Illinois Board for Vocational Education also recognizes the welding art as an important factor in restoring broken men to usefulness as well as repairing damaged equipment.

Many welding activities seem especially suited for maimed or otherwise partly disabled men. Even a legless man proved of such exceptional value to a Chicago transit company that officials sought modification of a policy forbidding his employment when a physical examination revealed his legless condition.

Bert Whalen, who at the age of eight years lost both legs under one of Chicago's old time cable cars, recently completed a course of instruction at the T. & T. School of Welding, 663 West Randolph street, Chicago. He proved to be a very apt student. The head of this school in a recent interview explained Mr. Whalen's training.

"We give individual instead of class instruction as we have found it the best way to assure that each student will get every part of the instruction. Even with small classes we found that some students, by reason of previous experience or aptitude, absorbed instruction more rapidly than others.

"Thus, we had exceptional opportunity to become acquainted with Bert Whalen and we were not at all surprised to learn that he made good with the transit company which employed him upon completion of his course. Nor were we amazed to learn that no one asked about his physical condition, for he wore his artificial legs with such ease that no one would think he was maimed.

"In the course of 15 days, the time came for the physical examination required of all employees of this corporation. When he undressed, he was told by the examining doctor that it would be useless to go ahead with the examination, as his legless condition disbarred him from railway employment.

"Two weeks of work, however, had proved him to be so valuable that the company was loath to lose him. His foreman appealed to the superintendent, explaining that Whalen's acetylene welding and cutting was all ground work and that he had proved to be a valued asset, combining skill with good habits which made him dependable. The superintendent took the case up with his superiors, in the hope of bringing about the reinstatement of Mr. Whalen. Meanwhile, Mr. Whalen landed work at higher pay with another company."

More striking in some respects is the story of Albert M. Haynes. The proprietor of the T. & T. School of Welding declared that Mr. Haynes did perfect work with a crude makeshift arm. A hook was fashioned so that it would hold the welding rod, the "feeding" of which Mr. Haynes was able to control by arm movement. His good hand took care of other details of the work. Before completing the course, he replaced the hook with a modern artificial hand. With this hand hidden in a leather work glove, he conducted his welding operations with such facility that newcomers at the school did not suspect his crippled condition.

Many other interesting stories of "scrapped" men being restored to service by the welding art are found in the records of this school. The reclamation story is really complete when "reclaimed" people find work reclaiming machinery. Other students find work in a production shop. Welding is continually opening up new possibilities in fabrication.

Arc welding a bridge structure for reinforcement

Welded Machine Fabrication In Step With Styling

Proper use of rolled plate and steel castings enables designer to achieve stylish lines with welding economy

By J. H. COOPER

Welding Engineer, The Taylor-Winfield Corp., Detroit, Mich.

INASMUCH as machine tool designers are becoming more and more style-conscious, the fabrication of machine tool bases of steel plate and rolled sections must of necessity show the effects of such a trend.

A few years ago the general run of fabricated bases were anything but pleasing in appearance. The usual procedure was to select rolled angles, channels, or beams of such a section as to give sufficient rigidity and join them together by welding. The corners were coped to fit and were usually square. Plates were added between rolled sections to achieve water or oil tightness. The over-all appearance was angular and awkward and made a poor contrast with a casting having pleasing curves and streamlined contours.

The modern fabricated machine base compares very favorably in appearance with a steel casting and has its own points of superiority. For example, rolled plate surfaces are free from the roughness associated with cast steel when displayed in large areas. Welds no longer need to be the unsightly straight fillets with the pronounced ripples, long associated with welds by using bare electrodes. Electrode manufacturers met this problem by developing heavily-coated electrodes which, when properly used, will produce slightly concave welds gradually flaring into the joined plates with no undercutting of these plates. The surface of such welds after sand blasting compares very favorably with the surface of the rolled plate.

The role of gas cutting in contributing to good appearance has been an important one. For example, in Fig. 1. The turntable base shown at the left was fabricated for the Acme Manufacturing Co., Detroit, Mich., and weighs only 3,833 lbs., but has the required elements of strength and rigidity. Yet, most anyone will agree that it presents a more attractive appearance than if a flat plate with straight angle or channel legs had been used. Undoubtedly the appearance of the die base shown in the left of Fig. 2 has been improved by the gas cuts made with the primary intention of weight reduction.

A streamlined appearance has been achieved in the fabrication of the control cabinet shown at the right in Fig. 1 by the elimination of all sharp corners. The added cost of such a design over a conventional square-cornered "box" is very slight.

Figure 3 shows three vertical columns for boring machines. These columns weigh approximately a ton each and are simple fabricated structures laid out with an eye to pleasing lines. As often happens, a smooth symmetrical appearance may also be an efficient design from a strength viewpoint. This is true of the arches which form the base of these columns.

Fig. 1—(Left) Turntable base weighing 3833 lb. has strength, rigidity and attractive appearance

Fig. 1—(Right) Elimination of sharp corners gives this control cabinet a streamline appearance

The cabinet shown in Fig. 4, without the covers for the openings, is one fabricated for the Woodward Governor Co., Rockford, Ill. It covers up the big actuator base inside which carries the necessary high-pressure piping and valves for a sub-unit of a hydro-control system. Each end of this cabinet has streamlined curves pressed into the steel sheets. The sheets used were "stretcher-leveled" steel which, when painted, present an excellent appearance. The four upper corners of the cabinet with their rather involved curves are steel castings set into the proper openings and welded in place.

This use of small castings brings us to another phase of fabricating for appearance. Figure 5 indicates a number of standard steel castings for fabricating into machine bases in places where it is awkward to form steel plate. Items 7, 9, 10, and 11 are segments of hollow spheres of different radii to be fitted into corners requiring such a contour. Items 1, 2, and 13 to 21 inclusive are typical of various footings used to obtain rounded corners and "hold-down" pads. Items 3, 4, 5, 6, 8, and 12 are sections of troughs used to carry the coolant used by the machine tools. Item 22 is a crown casting used exclusively for resistance welder frames.

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—J. H. COOPER

Fig. 2—(Left) Appearance of die base has been improved by oxy-acetylene cutting to achieve weight reduction

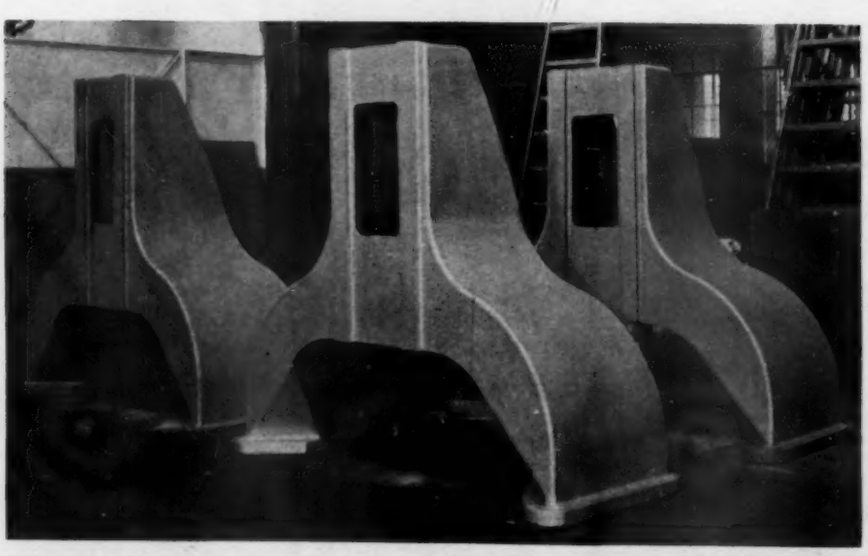


Fig. 3—Smooth symmetry is mechanically good design—Witness the arches in these boring machine bases

The Taylor-Winfield Corp. spot and press type resistance welder frames, are shown in Fig. 6. All of these contain crown castings in matched pairs. A section is cut out of the center of the casting to shorten it when necessary for small frames. The foot corner castings, Items 16 and 18, of Fig. 5, are used in the welder frame bases.

Diamond Boring Machine

A base for a diamond boring machine for automobile pistons, as designed by H. R. Krueger & Co. Detroit, Mich., is shown in Fig. 11. In this base, corner casting, Item 5, of Fig. 5, was used to make a coolant trough of pleasing shape. The smooth surface of the untouched weld around the bottom of this base is typical of a properly made weld.

A more complicated machine base is shown in Fig. 7. This base (weight 2,700 lbs.) is for a drilling machine designed by W. F. & John Barnes Co., Rockford, Ill., and contains a number of water-tight coolant compartments. Such a base has a num-

ber of box corners and rather inaccessible places to be welded. To obtain welds of proper appearance and quality, all work is positioned so that the operator is welding in a horizontal position. Alternating current and heavily-coated electrodes are used to avoid the leaks and unsightly welds resulting from welding in box corners which set up a strong magnetic disturbance with the direct-current arc. The use of flexible electrodes which may be bent to reach otherwise inaccessible positions is an advantage.

As is evident in Fig. 11 the appearance of any fabricated structure is improved by having all butt welds joining the various parts finish up flush with the outside. To accomplish this, all seams are given a sufficient bevel on the outside so that when the bevel is filled and the weld ground slightly with a portable grinder, the result is a continuous

Fig. 4—Each end of this cabinet has streamlined curves pressed into the steel sheets of which the cabinet is fabricated

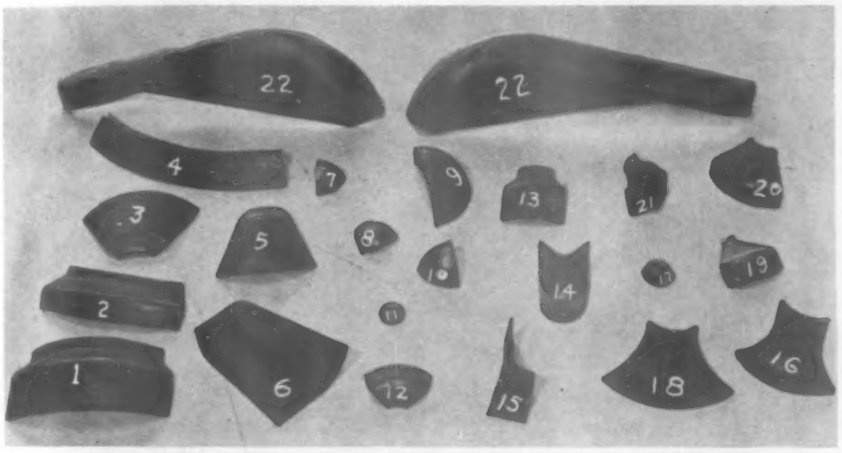


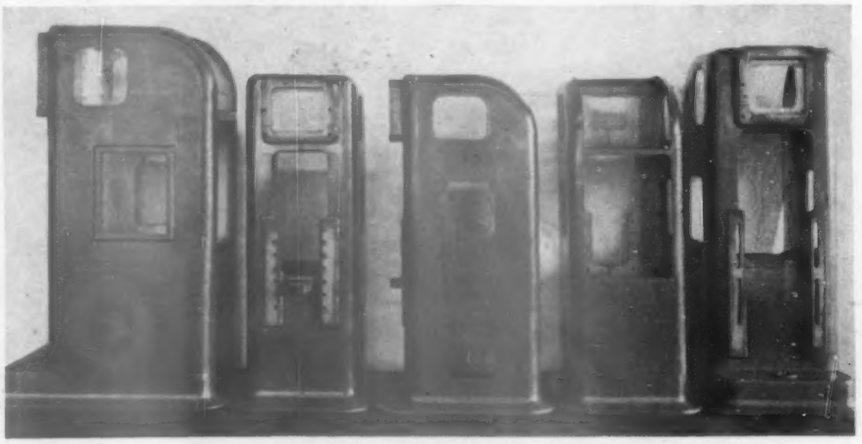
Fig. 5—Small steel castings can be fabricated into machine bases at points where it is awkward to form steel plate—Pieces are identified by number and referred to by number in this article

unit with no visible weld reinforcements. Inside the structure this procedure is not followed and the welds are left as ridges, sand blasted and cleaned of weld spatter.

Standard welding technique includes the exclusive use of heavily-coated electrodes which deposit weld metal of a strength and ductility comparable to the rolled low carbon steel plate used. Obviously, the strength requirements of welds for coolant troughs, footings and cabinets is low.

However, as a number of bases and presses fabricated have highly stressed welds, the most satisfactory results may be obtained by making all welds with high quality electrodes and a carefully controlled welding technique. The best economy is also obtained as this type of electrode has the highest deposition efficiency of available types.

Fig. 6—Resistance welder frames are fabricated with crown castings in matched pairs—Foot corner castings are welded into the frame base



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—J. H. COOPER

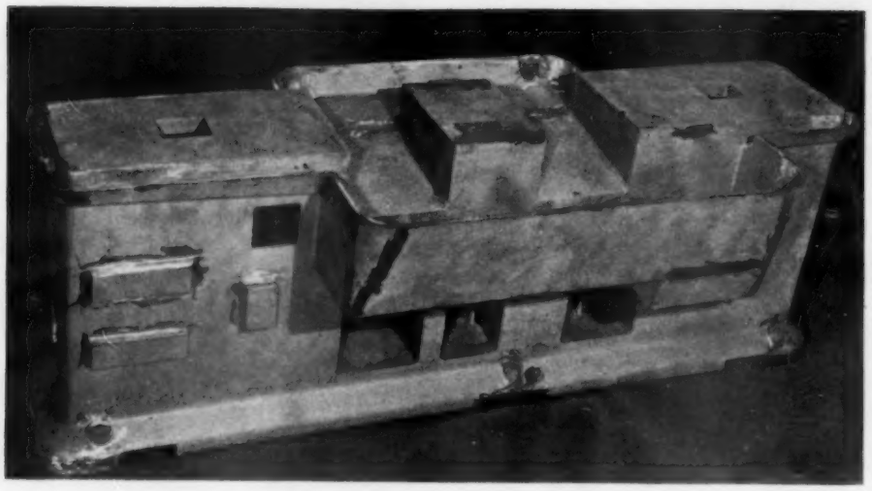


Fig. 7—Complicated drilling machine base contains several water-tight coolant compartments and other rather inaccessible places which were welded with alternating current and heavily coated electrodes

Fig. 8—Drilling machine base, weighing 3,000 lbs., another good example of modern styling in fabricated construction

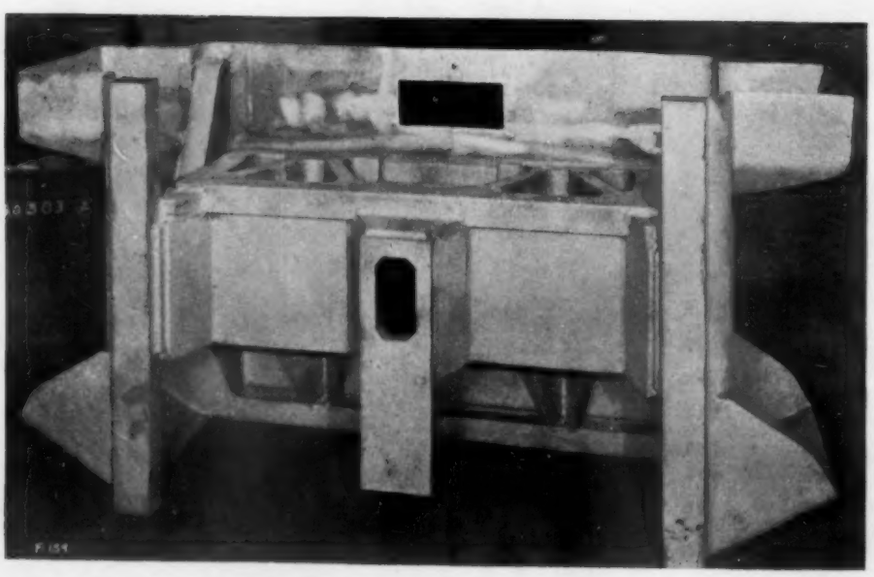


Fig. 9—Broaching machine table shows how effectively the designer and welding engineer have cooperated to achieve stylish appearance by use of rolled plates in conjunction with small castings

Fig. 10—Boring machine base, weighing 3700 lbs., has pleasing contours obtained by suitable combination of fabricated rolled plates and castings

Stress Relieving

Trough corner castings, Items 3 and 12, and footing castings, Item 19, Fig. 5, are commonly used. On such a base, only ¼ in. finish for machining is required. Painting is all that is required for a final finish after sand blasting. The bases are fully stress-relief annealed to avoid any future disturbances of highly accurate machining.

Figure 10, a 3,700-lb., four-way boring machine base and Fig. 8, a 3,000-lb. drilling machine base were fabricated for the Ex-Cell-O Aircraft and Tool Corp., Detroit, Mich. Figure 9 is a 1,500-lb. broaching machine table designed by the Michigan Tool Co., Detroit, Mich. The pleasing contours and simple, symmetrical lines achieved by the proper combination of fabricated rolled plate and castings are evident in these three bases of different types. In no case is utility sacrificed or compromised for appearance. The two go hand in hand and both follow prevailing styling trends.

Fig. 11—In this boring machine base, corner castings are used to make a coolant trough of pleasing shape

Simple Rating System for Welding Supervisors

By D. P. MASTERSON

The problem of setting up wage rates is quite often a perplexing one for the foreman or welding supervisor. The more welders in the shop, the more complex the problem. Some welding men insist that testing of sample welds should be the rating yardstick. But it is possible that a man may be able to make perfect welds and still not be satisfactory.

In every group of skilled workers there will be a few men who stand out above the rest of the group. They are the men who are most valuable to their employer. At the end of the scale will be men who cannot do an average job. It is the supervisor's job to grade all men equitably, according to their ability. Here is where it is most important to be able to convince the welders that the "boss" has formulated his ratings fairly and can tell them how they can step up their rating. By setting up a simple rating system the "boss" solves a troublesome problem and retains the confidence of his men.

Many workers, and welders are no exception, believe they know their job just a little bit better than the other fellow. If you try to explain to one of them why he is not worth the same scale of wages as the other fellow and cannot show him conclusively, you have lost his good will, his respect for you as a square-shooter, and probably have turned him into a breeder of discontent in your shop.

There are several things besides a man's ability to use a blowpipe or an electrode that may add or detract from his value. Among these factors might be listed the following:

1. Ability to do routine shop work.
2. Ability to do field work.
3. Ability to weld with both gas and arc.
4. Ability to lay out and fit up work.
5. Ability to overcome unusual conditions.
6. Ability to read blue-prints.
7. Ability to keep the equipment he is using in a good state of repair.
8. Willingness to cooperate with supervisors and fellow workmen.

All of these rating elements are of some value to the employer. His special line of work may cause him

TABLE 1—RATING FACTORS SIMPLIFY JOB OF DETERMINING VALUE OF WELDER TO HIS EMPLOYER.

Name	Routine Shop Work	Field Work	Gas & Arc Weld	Fitting Up Work	Reading Blue Prints	Condition of Equipt.	Cooperation—Willingness	Rating
(Points)	30	30	5	10	10	5	10	100
Smith	30	30	5	10	3	5	7	90
Brown	30	30	2	5	5	4	10	86
Jones	30	20	—	10	—	5	9	74
Black	26	10	—	5	5	4	10	60

to place great value on some and to discard some of the others as of no value in his field of work.

These items can be arranged into a chart and a definite value given to each as in Table 1.

One of the advantages of the above chart is that it is flexible. If most of the work is routine shopwork, then that should be rated as more important than fieldwork and given more consideration in the determination of rating factors. Field work requires welding in all positions, which may or may not be necessary in shopwork.

The ability to weld with both gas and arc is surely important where both are used to a great extent. A rush in a certain line of work may make it imperative that a welder be shifted from his regular work to the other process and it is surprising how few welders are able to do this effectively. They may claim to be able to do both, but as a rule they lack the desired training.

The reason for this probably lies in the fact that welding as a trade has been learned in the shops and when a man becomes skilled in one branch of welding his employer gives him little chance to learn any other process. It has been surprising how many welders have availed themselves of the opportunity to go to school and brush up on the welding of certain metals or on processes they are not familiar with.

Fitting up work and reading blue prints may be eliminated as a rating factor in some shops where production work is the rule. In others it may be rated as being equally important with the ability to weld. In a large chemical plant, where I had the opportunity of using this rating system, the work was spread out over an area of two square miles. It is obvious that the reading of blue prints and the assembling of work became an important part of the welders task.

Of the forty welders employed less than five could read blue prints with any degree of accuracy. This made it difficult for the supervisor and two foremen. The difficulty was met by organizing an evening class in blue print reading in a vocational high school nearby.

The man who keeps his equipment in good condition is surely saving his employer time and money and deserves credit for it.

Some of the best welders will destroy their usefulness to an organization by radicalism. They believe the company should pay them more money, even when the wage scale is already higher than others in the community. They know more than the foreman; they don't want to work with this or that fellow. They go merrily on their way, sowing seeds of discontent among their fellow workmen. Hence ability to become a working part of an organization must be considered as a personal rating factor.

Little material has been published on this subject and I believe its importance will be readily admitted by anyone who is concerned with the hiring or supervising of welders. While the above system is far from perfect, I believe it is a step in the right direction.

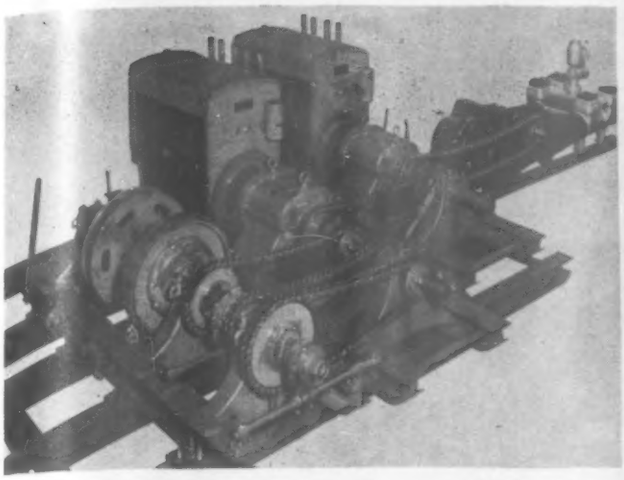
Welded Steel Bases For Oil Field Equipment

By H. S. CARD

Noteworthy among recent trends in the petroleum industry is the use of welded rolled steel bases for many kinds of heavy-duty units. The equipment used in the oil fields must be rugged enough to stand the roughest kind of handling; yet excess weight is discouraged because it adds to the cost of transportation, handling and installation. These costs are being held at a minimum by mounting complete working units on rigid bases, so that no time is lost in dismantling and setting up in new locations. In thus "unitizing" their machines, most of the oil well equipment companies have found it advantageous to use arc-welded bases fabricated from structural steel shapes. Such bases are not difficult to design, and offer the practical advantage of necessary stiffness and solidity with minimum weight. Such frames do not loosen under vibrating loads. Design changes to accomodate various requirements, can be made easily without involving the expense and delay of getting new patterns.

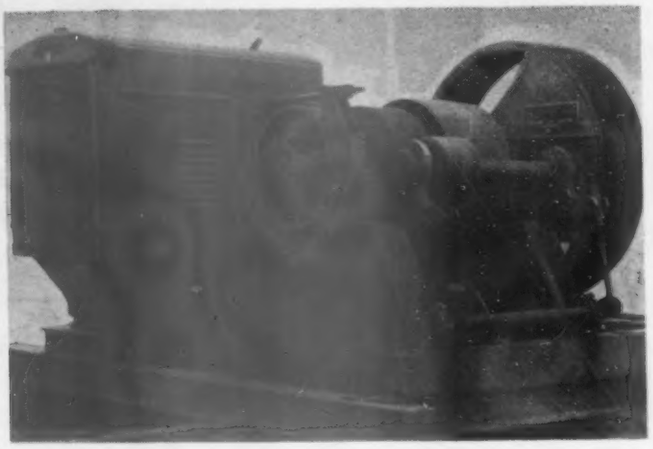
An example is the Model C-300 Rig for 6000-ft. drilling, made by the Portable Rig Company, Houston, Tex. This is powered by two 180-hp. or 150-hp. engines. The three-speed reverse clutch, which transmits engine power to the draw works, has 10 in., 54-lb. H-beams arc-welded to the base of bearing pedestals, forming a solid one-piece unit. Further in the specifications are listed: skids for draw works power unit and for pump drive power unit, 10-in. H-beams electrically welded and cross braced, substructures for both low and high derricks 10 in. high x 13½ in. wide x 21 ft. 2 in. long, 10 in. x 8 in., 37-lb. structural steel H beams cross-braced and welded.

Another example is the cable tool drilling unit made by Bridgeport Machine Company, Wichita, Kan.



Three-speed reverse clutch on drilling rig mounted on arc-welded H-beam, one-piece base

Cable tool drilling unit is readily portable because of arc-welded base construction



This unit has ample power to handle heavy tools and pipe for drilling to depths of 5,000 ft., yet it is extremely portable and convenient to move from one location to another, and ready to go to work as soon as it is unloaded from the truck. The main base is 12 ft. 6 in. long by 7 ft. 4 in. wide, constructed of arc-welded 8 in. x 8 in., 25-lb. H beams. The special engine sub-base is of arc-welded 6 in. x 6 in. 20-lb. H beams. The engine may be moved forward or backward to maintain correct tension on the Texropes, this being accomplished by an ingenious arrangement of forged steel adjusting screws securely affixed to extra heavy brackets on the engine sub-base.

Arc-welded structural shapes with cross bracing are used in the Fairbanks, Morse & Co. cable tool or drawworks drilling engine. This base preserves the alignment of working parts without incorporating excessive weight into the unit. It is also apparent that changes in design can be made at minimum cost.

Gulf Coastal Concern Builds Welded Vessels

By J. C. WATKINS

The application of arc welding to shipbuilding has marked the way to success for Bruno Schulz who came to the United States in 1909 to work in a bakery and remained to head a prosperous welding concern.

The Gulfport Boiler and Welding Works, Port Arthur, Texas, of which Mr. Schulz is the head, has launched five tugboats and more than 100 large all-welded steel barges in its brief period of existence.

About 1918 he thought he saw a future in electric welding, then coming into general use, and persuaded his employer to send him to an arc-welding school.

Returning to Port Arthur as an electric welder, he continued working for an oil company until 1920, when he took his savings of $500 and went into business for himself, launching his concern under its present name. Three years later his company laid the first all-electric-welded pipeline system in the south, for the Atlantic Pipe Line Co. at Atreco, near Port Arthur.

About 1930 Mr. Schulz conceived the idea that an all-electric-welded barge would be an improvement over the riveted type. He believed that such a barge would be lighter, stronger, and not subject to corrosion.

Putting his idea into practice, he built his first all-welded barge, 14 x 15 ft., in his shop and hauled it to the ship canal in a trailer. No sooner was it launched than the Standard Dredging Co., of Galveston, purchased it. That decided Mr. Schulz.

Installing a shipyard and equipment on a canal site, he concentrated on building tugs and barges, turning out vessels in rapid succession. Working his mechanics in two shifts, he has been able to build a 10,200-barrel all-welded steel barge in 12 days.

He constructed two all-welded seagoing tugs in 90 days. These vessels, one for the Sabine Transportation Co. and the other for the D. M. Picton Co., both of Port Arthur, are 92 ft. long, with a 10-ft. 6-in. draft and a 22-ft. beam. They are powered with 700-hp. engines.

Mr. Schulz is currently completing construction of a 9,200-barrel barge for gasoline service, for the Southern Oil Co.

Two all-welded steel tug boats built in exceptionally fast time—Powered with 700-hp. engines

Metal Exposition will be held in this huge Atlantic City auditorium

Expect Record Attendance at Atlantic City Meeting

Over 200 firms will exhibit—About 87 exhibits will be definitely of interest to welding men

INCREASING interest in welding and welded fabrication is expected to result in a record-breaking attendance at the 18th annual meeting of the American Welding Society, which will be held at the Hotel Traymore, Atlantic City, N. J., October 18 to 22. This is not only the biggest welding event of the year, it is without any doubt the biggest convention of the year in the metal working industries. Technical societies cooperating with the American Welding Society in this outstanding event are: American Society for Metals, American Society of Mechanical Engineers, American Institute of Mining and Metallurgical Engineers, and The Wire Association.

C. A. McCune, Chairman of the American Welding Society Convention Committee, reports:

"More than 15,000 top executives, engineers, metallurgists, technicians and welding enthusiasts from all parts of the country and from abroad will gather in Atlantic City during the third week in October of this year to listen to specialists speak on the work going on in the research laboratories of the Federal Government, universities and industrial organizations. Papers dealing with the practical application of welding in the fabrication, railroad, ship-building and other fields, and a welding symposium on alloy steels will draw large audiences.

"The welding and cutting exhibit in the Metal Exposition has always drawn an enthusiastic audience. This year will be no exception because of the large number of new developments during the year.

"Many will undoubtedly combine business with pleasure for a fall holiday week or two, by bringing their families to Atlantic City. The fact that the membership of the Society is almost double that of a year ago, and that many new chapters have been established in the Southwest, Northwest and in the South, leads us," Mr. McCune states, "to believe that the Atlantic City audience will surpass that of other years."

Meetings of the American Welding Society will be held in the Hotel Traymore. On following pages will be found a complete tentative program of the 18th annual meeting.

The annual business meeting will be held at 9:30 o'clock Monday morning, October 18, at which time President Gibson of the American Welding Society will make his address of welcome and annual report. It will be noted from the program that on Tuesday afternoon, October 19, the American Society of Mechanical Engineers will meet jointly with the American Welding Society to hear a discussion of "Resistance Welding Fabrication," by J. M. Cooper, General Electric Company, and of "Developments in Large Welded Structures," by C. C. Brinton, Westinghouse Electric & Mfg. Co.

No technical meetings are scheduled for Wednesday afternoon, October 20, because of the desire to provide members of the Society ample opportunity to visit the exhibits in the National Metal Exposition. However, several committee meetings are planned for Wednesday afternoon.

Transportation aspects of welding progress will be subjects of discussion on the program for Thursday afternoon and Friday morning. Four papers are to be presented on the importance of welding in ship building at the technical session Thursday afternoon, October 21. Three papers dealing with railroad welding applications are scheduled for the 9:30 A.M. technical session Friday, October 22.

Exhibits which make up the National Metal Exposition form a definite part of the Atlantic City program. Over 200 companies will exhibit their wares and of these about 87 will have exhibits definitely related to the welding field and of particular interest to welding men. The National Metal Exposition will open in the Atlantic City Auditorium at noon on Monday, October 18, and will be open from noon to 10:30 p.m. on each of the first three days of the week. On Thursday, the Exposition will be open from noon to 6 p.m., and on Friday from 9 a.m. to 6 p.m.

Reviewing the list of exhibitors, it is evident that an imposing group of metallurgical experts from the steel companies, alloy producers, heat-treating firms, and welding equipment manufacturers will be in attendance. Many of the displays will contain working models of considerable educational value.

The annual dinner dance is scheduled for 7 P.M. Thursday evening. Announcement of speaker for this big event has not yet been made. Special entertainment is being planned for the ladies throughout the five days of the convention. Tentative arrangements include luncheon and card parties, a trip around the island, and afternoon teas. Several interesting golf courses are available not far from the hotel. It is stated that moderate green fees are charged on these courses. Riding horses can be rented in front of the hotel for a ride along the beach.

Tentative Program of 18th Annual Meeting

Monday, October 18

9:30 A.M. Opening Session.

Senior Vice-President E. R. Fish, *presiding*

Announcements.

Greetings by Convention Committee Chairman C. A. McCune.

Address and Report of President Gibson.

Business Session.

President A. E. Gibson, *presiding*

Report on Welding Research Activities by C. A. Adams.

Status of Progress and Work by Committee Chairmen.

Award of Samuel Wylie Miller Memorial Medal *"for meritorious achievement contributing conspicuously to the advancement of the art of welding and cutting."*

Award of Lincoln Medal, *"for best paper of year in Welding Journal."*

Progress Report by Managing Director.

Review of Section Activities by Regional Vice-Presidents and Section Chairmen or Representatives.

Tellers' Report on Election of Officers.

Looking Ahead With The American Welding Society—President-Elect Lang.

12:00 Opening Metals Exposition—Convention Hall

2:00 P.M. Technical Session.

G. F. Jenks, *Chairman*, Col. Ord. Dept., U. S. Army.

E. Vom Steeg, *Vice-Chairman*, General Electric Company.

INDUSTRIAL RESEARCH

Weldability of Low Alloy Steels, by W. L. Warner, Watertown Arsenal.

The Spot Welding Characteristics of Some Copper Base Alloys, by D. K. Crampton and J. J. Vreeland, Chase Brass & Copper Company.

Survey of Low-Alloy Steels as to Weldability, by J. H. Critchett, Union Carbide & Carbon Res. Laboratories.

Physical Properties and Corrosion Resistance of Nickel-Iron Alloys Formed in the Welding of Nickel-Clad Steel, by J. H. Deppeler, W. G. Thiesinger and F. G. Flocke.

X-ray Methods of Studying Stress Relief in Welds, by J. T. Norton, Massachusetts Institute of Technology.

6:30 P.M. Board of Directors' Meeting

Dinner followed by meeting.

Review of Society activities, appointment of committees and officers.

New Business.

Tuesday, October 19

9:30 A.M. Technical Session.

Everett Chapman, *Chairman*; Lukenweld, Inc.

Otto H. Henry, *Vice-Chairman*; Polytechnic Institute of Brooklyn.

FUNDAMENTAL RESEARCH IN WELDING

Fatigue Tests of Butt Welds in Plates, by W. M. Wilson, University of Illinois.

Proximity Effect in Welding Problems, by E. Bennett, University of Wisconsin.

The Heat Effect in Welding—by W. H. Bruckner, U. S. Naval Research Laboratory.

The Electric Industry and the Welding Industry, by A. S. Douglass, The Detroit Edison Co.

Two Simultaneous Technical Sessions.

2:00 P.M. Technical Session.

T. M. Jackson, *Chairman*, Sun Shipbuilding & Dry Dock Company.

J. H. Zimmerman, *Vice-Chairman*, The Linde Air Products Company.

Aerial view of Atlantic City's famous board walk and bathing beach

FUNDAMENTAL RESEARCH IN WELDING

Welded Girders with Inclined Stiffeners, by Cyril D. Jensen, Lehigh University.

Welding of Copper, by A. P. Young, Michigan College of Mining & Technology.

Static and Impact Tensile Properties of Stainless Steel Welds at Ordinary and Low Temperatures, by O. H. Henry, Polytechnic Institute of Brooklyn.

Effect of Welded Top Angles on Beam-Column Connections, by Inge Lyse, Lehigh University.

High-Speed Motion Pictures of Flame Cutting, by H. R. Bullock, Massachusetts Institute of Technology.

JOINT SESSION WITH AMERICAN SOCIETY OF MECHANICAL ENGINEERS

2:00 P.M. Technical Session.

G. F. Nordenholt, *Chairman,* Product Engineering.

J. W. Sheffer, *Vice-Chairman,* American Car & Foundry Co.

Resistance Welding Fabrication, by J. M. Cooper, General Electric Company.

Developments in Large Welded Structures, by C. C. Brinton, Westinghouse Electric & Mfg. Co.

Recent Developments in Fusion Welding, by C. W. Obert, Union Carbide & Carbon Research Labs.

7:30 P.M. Conference and Meeting of Fundamental Re-Research Committee.

H. M. Hobart, *Chairman,* General Electric Company.

This conference is scheduled for university research workers in the fundamentals of welding.

Wednesday, October 20

9:30 A.M. Technical Session.

H. C. Boardman, *Chairman,* Chicago Bridge & Iron Works.

E. V. David, *Vice-Chairman,* Air Reduction Sales Company.

FABRICATION

Carbon Arc Welding in Automotive Work, by William Richards, Chevrolet Motor Co.

Automatic Resistance Welding, by Harry Landstrom, Nash-Kelvinator Corp.

Welding—An Aid in Dam Construction, by T. B. Jefferson, U. S. Engineers Dept.

Oxy-Acetylene Welding as a Production Tool, by A. Bell, Engineer, Heywood-Wakefield Co.

12:30 P.M. Luncheon Conference.

Officers and Members Executive Committees of Sections of Society.

2:00 P.M.

No technical sessions are being scheduled for Wednesday afternoon in order to provide members of the Society an opportunity to see the Metal Exposition. Several committee meetings will, however, be held.

Thursday, October 21

9:30 A.M. Technical Session.

W. M. Mitchell, *Chairman,* Carnegie Illinois Steel Co.

J. J. Crowe, *Vice-Chairman,* Air Reduction Sales Company.

SYMPOSIUM ON ALLOY STEELS

Low Alloy Steels—G. S. Mikhalapov, Heintz Manufacturing Company; A. B. Kinzel, Chief-Metallurgist, Union Carbide & Carbon Research Labs.

Stainless Steel As Applied to Pressure Vessels, by J. C. Holmberg, Struthers-Wells-Titusville Corp.

2:00 P.M. Technical Session.

Charles I. MacGuffie, *Chairman,* General Electric Company.

Milton Male, *Vice-Chairman,* U. S. Steel Corporation.

SHIPBUILDING

Welding in Building Tanker Vessels, by T. M. Jackson, Sun Shipbuilding & Dry Dock Co.

Assembly Plant for the Welding of Barges, by Geo. F. Wolfe, Dravo Corporation.

Tests and Arc Welding in Ship Structure, by Lieut. Commdr. W. P. Roop, U. S. Navy.

All-Welded Steel Tankers, by A. C. Leigh, The Ingalls Iron Works Co.

7:00 P.M. Dinner Dance and Entertainment

Friday, October 22

9:30 A.M. Technical Session.

P. G. Lang, Jr., *Chairman,* The Baltimore and Ohio Railroad Company.

A. F. Davis, *Vice-Chairman,* The Lincoln Electric Company.

RAILROAD SESSION

Building Up Locomotive Driving Boxes, by I. T. Bennett, Revere Copper & Brass, Inc.

Machine Gas Cutting in Railroad Work, by H. Bass, New York Central Railroad.

Welding of Railroad Rolling Stock, by V. R. Willoughby, American Car and Foundry Co.

General view of Atlantic City auditorium

Partial List of Exhibitors at National Metal Exposition

List of 87 exhibits where products or services will be related to the welding field

Air Reduction Sales Co., New York. (Booth E-62.)

Exhibiting: Welding and cutting torches, brazing and hard facing apparatus.

Allegheny Steel Co., Brackenridge, Pa. (Booth G-47.)

Exhibiting: An interesting display of Allegheny Metal. The center section is a steel mill scene painted in several planes to give a three dimensional appearance. In the foreground is a mechanized stamping machine out of which come finished products made from Allegheny Metal.

Aluminum Company of America, Pittsburgh, Pa. (Booth G-4)

Exhibiting: Aluminum alloys.

The American Brass Company, Waterbury, Conn. (Booth C-47.)

Exhibiting Special Anaconda engineering alloys and condenser tubes. Among the alloys exhibited will be Everdur, the high strength, weldable, structural metal; Beryllium Copper, the new heat-treatable copper-base alloy with exceptionally high physical values; Ambraloy; Tobin Bronze; and various Phosphor Bronze alloys. There will be special displays of Everdur in the form of electrical conduit, welded pressure vessels, bolts, nuts, screws and other parts.

The condenser tube section will include a prominent display of Super-Nickel tubes made by the extruded, rolled and drawn method in addition to the other standard Anaconda condenser tubes.

Another section will show Anaconda Copper and Bronze welding rods and broken metal parts repaired by bronze welding. A general exhibit of Anaconda sheet, wire, rod and tubes in various alloys will complete the arrangement.

American Coach & Body Co., Cleveland. (Booth A-73.)

Exhibiting (in operation): Portable, flexible, and adaptable spot welder of 75 KVA capacity.

In attendance: M. L. Eckman, chief engineer; and Vladimir Prech, operator.

American Institute of Mining and Metallurgical Engineers, New York. (Booth A-80)

Exhibiting: Educational exhibit.

American Rolling Mill Company, Middletown, O. (Booth E-40)

Exhibiting: Stainless steels, enameling iron, sheets and plates.

American Society For Metals, Cleveland, O. (Booth H-85)

Exhibiting: Educational exhibit.

American Welding Society, New York. (Booth C-3)

Exhibiting: Educational exhibit.

Ampco Metal, Inc., Milwaukee. (Booth H-2.)

Exhibiting: Various parts showing the uses of Ampco Metal, an extremely wear-resistant alloy of copper, aluminum, and iron. Available in sand castings, individual centrifugal castings, rolled and forged material. Some of the parts to be displayed will include gears, bushings and bearings, acid resistant equipment, feed nuts, welding jaws, non-sparking safety tools, and forming and drawing dies.

Castings of Ampco Beryllium-Copper and of hard high conductivity alloy for electrical service.

Arcos Corp., Philadelphia. (Booth B-2.)

Exhibiting (in operation): Welded stainless and welded non-ferrous products fabricated with Arcos special electrodes. We will operate a test showing corrosion resistance of 19/19 chrome-nickel weld metal.

In attendance: R. D. Thomas, president; H. E. Hopkins, treasurer; D. D. Wachter, sales manager; T. H. Nelson, sales; F. S. Tate, sales; and A. M. Taylor, superintendent.

Automatic Gasflux Inc. (Booth A-78)

Exhibiting: Fluxes automatically fed into gas line for welding operations.

Buehler (Adolph I.) (Booth B-17)

Exhibiting: Metallographic equipment.

Bastian-Blessing Co., Chicago. (Booth A-23.)

Exhibiting: Demonstration of production gas welding. Will conduct a daily contest in which visitors will be invited to participate—Prize given each day for closest estimate of number of parts welded daily at the exhibit.

In attendance: E. L. Mills, vice-president and sales manager; C. M. Eveleth, engineer; H. A. Goodwin, district sales manager; R. Adam Johnstone, district sales manager; H. O. T. Ridlon, district sales manager.

Bethlehem Steel Co., Bethlehem, Pa. (Booth D-66.)

Exhibiting (in operation): Talking towers with physical property charts, fractures, and photomicrographs will describe and show the effect of heat treatment on carbon, manganese, nickel, nickel-chrome, molybdenum, and spring steels.

A working model of the electric furnace heat treatment department with accompanying transparencies of views inside the plant.

A display of fractures and photomicrographs showing the effect of finishing temperatures and methods of cooling on hot rolled steels.

Tempered sheets with a range of temperatures showing the hardness effect on the samples.

The Carborundum Co., Niagara Falls, N. Y. (Booth H-24.)

Exhibiting: Complete exhibit of abrasive and refractory products relating to the metal industry. Latest models of Carborundum Brand Hutton honing precision machines. Globar non-metallic electric heating elements.

Colmonoy Company, Los Nietos, Calif. (Booth G-76)

Exhibiting: Hard facing materials, cutting tools.

Continental Machine Specialties, Inc., Minneapolis. (Booth B-18.)

Exhibiting (in operation): The Doall contour machines will be shown in operation. In the booth will be a Metal-master model and the standard model "J." All functions of the machine, including sawing, filing and polishing, will be demonstrated. Materials worked on will include tool steels, mild steel, aluminum, copper, brass, alloys, as well as asbestos, hard rubber, carbon and plastics, such as bakelite, plexiglass and lucite. Also on display will be representative examples of special parts, dies, templates, cams, jigs and special tools.

In attendance: J. W. Wilkie, vice president; Floyd Hooper, advertising manager; D. A. Moreinis, New York office; and L. A. Peirez, New York office.

Detroit Testing Machine Co., Detroit. (Booth H-39.)

Exhibiting (in operation): Complete line of testing machines including: Direct reading power Brinells; hand operated Brinells; ductility testers; tensile and universal testing machines.

In attendance: Ralph Campbell, partner; and Fred H. Nass, partner.

Dow Chemical Company, Midland, Mich. (Booth G-86)

Exhibiting: Magnesium alloy die castings, forgings, rolled sheets, plates, and extruded sections.

Eisler Engineering Co., Newark, N. J. (Booth G-71.)

Exhibiting: Electric spot welders, Electric butt welders, A-C. transformer type arc welders, Automatic timers and contactors, Welding tips, Water-cooled electrode holders.

In attendance: Charles Eisler, Joseph A. Morick, A. Marcus.

Electro-Alloys Company, Elyria, O. (Booth C-20)

Exhibiting: Heat and corrosion-resisting alloys.

Electro Metallurgical Co., New York, N. Y. (Booth H-52.)

Exhibiting: A portrayal of chromium steels, including their advantages and applications in the petroleum, power, and chemical industries, and featuring the beneficial effects of columbium in these steels. Striking colored murals, reproduced from actual photographs, will depict many varied applications, ranging from heat interchangers and oil refinery tubing to airplane engine exhausts and collector rings.

The use of columbium both in austenitic chromium-nickel stainless steel to eliminate possibility of intergranular corrosion, and in 4 to 6 per cent and higher chromium steels to prevent air-hardening, improve resistance to oxidation at high temperatures, and stabilize toughness regardless of heat-treatment, will be illustrated by test specimens. Metallurgists familiar with these steels will be in attendance and ready to answer all questions.

Ferrolene Gases, Inc., Cleveland. (Booth A-78.)

Exhibiting (in operation): A demonstration of bronze welding with new type of flux injected into the gas stream. This is the new process recently developed and will be shown at the show for the first time. All that is required is a portable fluxer, with cylinder, acetylene, and oxygen. Also a demonstration of Ferrolene gas cutting with a machine torch.

In attendance: W. L. Ulmer, president; and C. A. Medsker, chief engineer.

Firth-Sterling Steel Company, McKeesport, Pa. (Booth F-68.)

Exhibiting: Carbide tools, stainless steel products, wear resisting parts.

General Alloys Co., Boston. (Booth E-10.)

Exhibiting: Nickel-chromium alloys, Q-Alloys; carburizing and annealing containers; cyanide and lead pots, furnace hearths, roller rails, heat and acid resisting chain; cyanide dipping baskets, recuperators, miscellaneous furnace parts, parts for every type heating furnace—carburizing, annealing, normalizing, hardening, tempering, forging, spheroidizing, tubes and retorts, corrosion and abrasion resisting castings.

General Electric Co., Schenectady, N. Y. (Booth A-33.)

Exhibiting: With the co-operation of Jacobs Manufacturing Co., Hartford, Conn., General Electric will exhibit complete electric-furnace equipment for scale-free hardening and drawing of drill-chuck sleeves. The equipment, which will be in actual operation, is a duplicate of that used by the Jacobs Manufacturing Co., and includes a scale-free hardening furnace, a drawing furnace, and degreasing equipment.

In addition to electric-furnace equipment, General Electric will demonstrate the latest types of arc-welding apparatus, including the new G-E Mutator (d-c.) arc welder for use with light-gauge metals; and new single-operator (d-c.) sets, including both motor-generator combinations and gasoline-engine-driven equipments. A complete line of G-E arc-welding accessories will also be on display.

Modern industrial x-ray equipment will be shown by the General Electric X-Ray Corp.

In attendance: C. L. Ipsen, R. M. Cherry, E. W. Cunningham, F. H. Hill, R. F. Newell, L. B. Rosseau, A. R. Ryan, H. E. Scarbrough, L. D. Meeker, B. C. Tracey, W. A. Terry, R. F. Wyer, E. Vom Steeg, Jr., W. E. Wilson, F. C. Smith, C. I. MacGuffie, H. O. Westendarp, L. A. McGraw, W. M. B. Brady, H. P. Doud, J. N. Black, R. W. McCoury, J. N. Willard and others.

General Electric X-Ray Corp., Chicago. (Booth A-33)

Exhibiting: Industrial X-ray testing equipment.

Halcomb Steel Company, Syracuse, N. Y. (Booth B-8)

Exhibiting: Alloy steels and tool steels.

Handy and Harman, New York. (Booth B-35)

Exhibiting: Brazing alloys and silver solders.

Harnischfeger Corp., Milwaukee, Wis. (Booth C-1.)

Exhibiting (in operation): P & H Hansen Smootharc welders using Smootharc welding electrodes.

Introduction of the new P & H electric hoist with variable speed push button control—one ton capacity.

The popular 250 pounds capacity Zip-Lift Electric Hoist.

Entire display of the Smootharc electrodes showing their physical characteristics.

In attendance: J. C. Joublanc, chief metallurgist; G. W. Hoskins, sales engineer, Philadelphia office; U. V. Westover, sales engineer, New York office; F. Leslie, sales engineer, New York office; L. M. Stout, district manager, Philadelphia; J. P. Morrissey, welding rod sales manager; and H. R. Noble, sales engineer, New York office.

Haynes Stellite Co., New York, N. Y. (Booth H-52.)

Exhibiting: Will participate in a joint exhibit with Electro Metallurgical Co. and The Linde Air Products Co. These three companies are units of Union Carbide and Carbon Corp. and will occupy Booths G-50, G-62, and H-52.

Haynes Stellite exhibit will feature Haynes Stellite cutting tools for machining steel, semi-steel, cast iron and other metals; special Haynes Stellite castings; Haynes Stellited wearing parts; and Hastelloy corrosion-resistant alloys.

The cutting tool exhibit will display standard Haynes Stellite J-Metal and "2400" tool bits, milling cutter blades, welded tip tools and other small tools for use on special machine tool equipment. The Haynes Stellited parts to be shown will include automotive and aircraft engine valves and valve seat inserts, valves of various types for handling high-pressure, high-temperature steam, as well as numerous small parts subjected to undue wear, the surfaces of which are protected by an abrasion-resistant coating of Haynes Stellite. A display of parts for service in chemical plant equipment and fabricated of one of the four Hastelloy alloys will occupy another section of the booth.

Hobart Brothers Co., Troy, Ohio. (Booth C-38.)

Exhibiting (in operation): A full line of Hobart "simplified" arc welders, including models for welding light gauge sheet metal as well as for heavier work. The new Hobart magnetic type motor horsepower control will be demonstrated in connection with electric motor driven models. Complete gasoline engine driven equipment and generators only for belt or coupling operation. Provision will be made for demonstrating the equipment on various kinds of work and with various types of electrodes.

In attendance: E. A. Hobart, president; W. H. Hobart, vice president; O. H. Menke, factory manager; E. C. Galbreath, general sales manager; W. J. Chaffee, welder sales manager; E. K. Butterfield, welder sales; Dorsey C. Anderson, Philadelphia distributor; H. P. Gordon, New York City distributor; Leo Gordon, Boston distributor; J. Rosencrans, New York City distributor; and Henry Wehrheim, Newark, N. J., distributor.

Hollup Corporation, Chicago, Ill. (Booth A-62.)

Exhibiting: Working demonstration of Sureweld protected arc electrodes. Exhibit of rods and electrodes of Hollup manufacture. Demonstration on alloys and mild steel.

In attendance: O. L. Howland, sales manager; A. M. Candy, consulting engineer; R. E. Long, chief engineer; W. S. Gilpin, service engineer; W. E. Palmer, New York district manager; H. F. Zeigler, sales engineer; G. O. Rohder, sales engineer.

The International Nickel Co., Inc., New York. (Booth E-75.)

Exhibiting (in operation): Samples of the commercial application of the nickel alloy steels, nickel cast irons, Ni-Resist, Ni-Hard, nickel bronze and other nickel-containing alloys.

In attendance: T. N. Armstrong, H. Beasley, E. J. Bothwell, C. E. Brinker, D. A. Curry, O. B. J. Fraser, H. J. French, George Geiger, Harold Geiger, E. J. Hergenroether, Wm. J. Kirk, F. L. LaQue, H. Larsen, H. S. Lewis, Charles McKnight, C. R. McGrail, A. C. Meyers, D. A. Nemser, N. B. Pilling, J. W. Sands, H. E. Searle, G. W. Strahan, J. S. Vanick, F. J. Walls, R. A. Wheeler, and T. H. Wickenden.

Jessop Steel Co., Washington, Pa. (Booth G-10.)

Exhibiting (in operation): Stainless steel in various finishes to show the applicability to decorative work.

A small press will be in operation to show the severe abuse that a die and punch must withstand. Movies of a general nature and of specific operations such as inspection and testing. A series of photographs indicating the importance of tool steel in the average citizen's everyday life. A variety of tools and products.

The evolution of a stainless steel knife from electric furnace to final application. The evolution of a composite high speed steel hack saw. The evolution of a 3-ply silverbond composite stainless steel frying pan.

A "memory" contest in which the winners will be awarded prizes each day will also be a feature.

Jones & Laughlin Steel Corp., Pittsburgh, Pa. (Booth E-32)

Exhibiting: Hot and cold rolled steel, tin plate.

Krouse Fatigue Machine Co., Columbus, Ohio. (Booth F-5.)

Exhibiting (in operation): High speed fatigue machines, 20 in. lb. capacity. High speed fatigue machines, 100 in. lb. capacity. Testing three sizes of straight shank specimens. Wire fatigue testing machine. Thin sheet fatigue testing machine. Plate fatigue testing machine, capable of testing up to ⅜ in. steel plate.

In attendance: G. N. Krouse, president.

Lincoln Electric Company, Cleveland, O. (Booth C-32.)

Exhibiting: Demonstration of latest developments in arc-welding generators, electrodes and accessories. The exhibit will feature various models of the latest "Shield-Arc S.A.E." arc welder, introduced last year. The feature of the machine is its system of arc control permitting continuous adjustment of both arc heat and arc penetration in a continuous sequence of fine increments. The machine substitutes positive arc control for the compromise setting said to be necessary with ordinary arc welders. "Shield-Arc S.A.E." welders will be in operation supplying current to both manual and automatic welding exhibits. Exhibit will also include the SA-150, a small machine of moderate price.

Latest developments in arc-welding electrodes will be shown and demonstrated. Included will be two new "Fleetweld" electrodes developed to meet specific demands for welding of mild steel: "Fleetweld 8," which eliminates necessity of multiple pass welding in production of fillet and lap welds in many applications, and which permits production of such welds without undercutting or overlap; and "Fleetweld 9," which provides welds of new high quality in flat welding of deep groove joints. Exhibit will also include "Aerisweld" for welding bronze, brass and copper; "Chromeweld 4-6" for 4-6 chrome steel; "Toolweld" for tools and dies; and the various other well known Lincoln electrodes for high manganese steel, high-tensile steel, sheet metal, stainless steel, cast iron, aluminum, etc.

Completing the exhibit of welders and electrodes will be a full line of the newest in electrode holders, welding cable, helmets, protective shields, safety clothing, etc. In addition to the arc welding display, the company will show latest models of its "Linc-Weld" motors.

The Linde Air Products Co., New York, N. Y. (Booth H-52.)

Exhibiting: Recent important developments of the oxy-acetylene process will be exhibited. The advances of oxy-acetylene machine cutting will be particularly featured and several of the latest cutting machines will be on view to show how the demands for various applications of flame cutting have been answered with specially designed equipment. The new Oxweld Type CM-12 shape cutting machine, which covers a scope of work hitherto impossible with one machine, will be in actual operation.

Other features will include: several new acetylene generators which have been introduced during the past year; a new line of Oxweld oxygen and acetylene regulators; and the latest in hand cutting and welding blowpipes. Working demonstrations will portray some of the recent advancements in oxy-acetylene welding equipment and procedures.

Ludlum Steel Co., Watervliet, N. Y. (Booth G-95.)

Exhibiting: Tool steel, stainless, stainless castings, nitralloy, FCC products, welding electrodes.

In attendance: Members of Ludlum Steel Co. staff; William L. Weaver, stainless casting sales; Truman Brown, special representative; A. W. F. Green, metallurgist; W. H. Wills, metallurgist. Members of Edgcomb Steel Co. staff; Leslie Edgcomb, president; W. H. Franklin, vice president; S. B. Mathews, manager, stainless steel department; G. Peterson, manager, tool steel department; and C. S. Vogel, welding engineer.

Macklin Co., Jackson, Mich. (Booth G-45.)

Exhibiting: Panel background with display of grinding wheels. Large photographs indirectly lighted showing grinding operation.

In attendance: C. L. Wiles, G. J. Rooney, and E. E. Halladay.

Maganese Steel Forge Company, Philadelphia, Pa. (Booth H-45)

Exhibiting: Welding wire, manganese steel wire, screens and forgings.

Magnaflux Corporation, Chicago. (Booth G-42)

Exhibiting: Inspection methods and equipment.

Magnetic Analysis Corp., Long Island City, N. Y. (Booth G-83.)

Exhibiting (in operation): Magnetic analysis 3 inch dual method equipment for the inspection of steel for its different characteristics completely set up and in operating condition.

In attendance: Wm. S. Gould, Jr., vice president; F. O. Fischer, engineer in charge of sales and service; J. D. Wilfong, Jr., sales and service engineer; and Theodor Zuschlag, chief engineer.

Manhattan Rubber Mfg., Company, Passaic, N. J. (Booth G-35)

Exhibiting: Abrasive cut-off and finishing wheels.

Maurath, Inc., 7309 Union Avenue, Cleveland, Ohio. (Booth A-50.)

Exhibiting: Welding electrodes.

In attendance: Whitey Maurath.

The McKay Co., Pittsburgh. (Booth H-81.)

No equipment will be displayed. Booth will be used to announce the entry of The McKay Company into the arc welding electrode field.

In attendance: Thomas J. McKay, president; Marcus R. Peck, vice president; Frank A. Bond, vice president; James C. McKay, vice president; C. E. Briner, purchasing agent; Fred H. Lewis, plant manager, York, Pa.; Thomas J. McKay, Jr., sales department; M. J. Van Dreser, sales department; L. E. Faulkner, chief chemist; Dr. Davis Helm, research engineer; and John Harris, research engineer.

Metal & Thermit Corp., New York. (Booth F-22.)

Exhibiting (in operation): The complete line of Murex heavy coated electrodes, including the newly developed Murex Genex and Murex Vertex, will be on display. Genex is an all-purpose electrode, specially designed for welding where the fit-up between plates is poor. Vertex is a three-position electrode for flat, vertical or overhead welding. Electrodes will be demonstrated in a welding booth where an expert operator will be in attendance at all times.

In addition, there will be a second booth where frequent demonstrations of Thermit welding will be given and actual welds will be made by the Thermit process.

In attendance: John B. Tinnon, sales manager; J. H. Deppeler, chief engineer; C. D. Young, Chicago manager; H. T. Thompson, Pittsburgh manager; John Plaskon, sales engineer; E. J. Knapp, sales engineer; C. D. Cooper, sales engineer; and Merritt L. Smith, advertising manager.

Metals Coating Co. of America, Philadelphia, Pa. (Booth E-62)

Exhibiting: Sprayed metal coating equipment.

Molybdenum Corp. of America, New York. (Booth C-35)

In attendance: M. Hirsch, president; V. R. Lansing, vice president; E. A. Lucas, vice president; W. H. Phillips, vice president; N. F. Tisdale, metallurgical engineer; E. Steward, Western sales manager; and H. Furlong, Detroit sales manager.

Morrison Engineering Co., Inc., Cleveland. (Booth C-33.)

Exhibiting (in operation): Morrison "Flash Baker" for baking wire rods. This baker is a pit-type oven. The top is sealed by high velocity air curtain. The hot air enters the chamber at high velocity and passes directly into coils from both ends, fusing throughout wire strands of the coils. The rods are baked in a few minutes.

The baker is designed for either straight line or circular cleaning line plan, requiring minimum floor space, and economy in operation.

A Morrison welding rod drying unit for baking flux coated welding rods. This unit is an oven made up of individual baking zones, all heated by a Morrison direct gas fired air heater. The heat is separately controlled in each zone to best suit the condition of the rods. The welding rods are conveyed through these zones on specially designed chain, remaining thereon until they emerge from the oven, completely and satisfactorily baked.

This drying unit gives high production, is economical to operate, and requires minimum floor space.

In attendance: J. R. Morrison, president; C. J. Pimsner, vice president; C. A. Litzler, engineer; W. H. Shelton, sales engineer; and G. C. Paxton, production superintendent.

National Carbide Corp., New York, N. Y. (Booth E-62.)

Exhibiting: National Carbide, National Carbide Lanterns, and National Carbide VG Lights.

In attendance: L. A. Hull, vice president; E. C. Ackerman, general sales manager; R. C. Holcomb, service manager.

National Cylinder Gas Co., 205 West Wacker Drive, Chicago, Ill. (Booth B-22.)

Exhibiting: A No. 646 National oxy-acetylene shape cutting machine will be in operation in our booth. This machine will demonstrate shape cutting by following the lines of a drawing laid out on the template table, and by automatically following a template laid out on the template table. Cuts made with this equipment can be controlled so accurately that a very smooth cut held closely to dimensions is the result. On many operations the cut edge is so smooth, square and accurate that no machine shop work is necessary.

In attendance: A. G. Scherrer, District Manager, North Bergen, N. J.; Joseph Noakes, Service Representative; Chester Mott, Chicago; H. C. Dowson.

Norton Co., Worcester, Mass. (Booth A-1.)

Exhibiting (in operation): A variety of abrasive products used by industry. The variety of colors resulting from uses of various abrasive and bond combinations for grinding wheels and other abrasive products. By means of a conveyor belt a different group of abrasive products is brought before the audience every 20 seconds. These abrasive products include grinding wheels, many varieties of sharpening stones, abrasive paper and cloth, laboratory ware and refractories, rubbing bricks and sticks, cutting-off wheels, diamond wheels and non-slip flooring materials made of abrasives.

Olsen (Tinius) Testing Machine Co., Philadelphia, Pa. Booth C-18)

Exhibiting: Testing machines.

Owen Electric Sales Co., Fayetteville, N. Car. (Booth C-4.)

Exhibiting: Owen A-C. Induction-Oscillator Welders.

In attendance: L. N. Whitted and F. C. Owen.

Page Steel & Wire Division, American Chain & Cable Co., Monessen, Pa. (Booth A-32.)

Exhibiting: Welding electrodes, stainless steel electrodes, stainless steel wire for mechanical purposes.

In attendance: W. H. Bleecker, J. J. Flaherty, E. L. Schaffer, K. Hubach.

Henry Pels & Co., New York, N. Y. (Booth F-3)

Exhibiting: Cutting and fabricating machines.

Horace T. Potts Co., Philadelphia. (Booth G-72.)

Exhibiting (in operation): Parts made from Horace T. Potts' steels with particular emphasis on stainless, Carpenter matched tool steels and Elastuf steels.

There will be a tool steel selector in operation indicating the method of determining the various types of tool steels.

Production Machine Co., Greenfield, Mass. (Booth F-80.)

Exhibiting (in operation): Production type No. 101 patent centerless belt sanding, polishing, finishing and buffing machine for tubes, rod and bar work.

Type "S" production centerless polishing and finishing machine.

Peerless type No. 1—9 in. horizontal production surfacing machine.

Production type No. 2—14 in. horizontal peerless surfacing machine.

Production type No. 601—4 in. bench handy speed finisher.

Production type No. 606—6 in. peerless surfacer.

Production type "R" multi-purpose utility machine.

In attendance: W. S. Howe, president; A. H. Behnke, vice president; and T. A. Welch, superintendent.

Republic Steel Corp., Cleveland, Ohio. (Booth D-32)

Exhibiting: Alloy and stainless steels, sheets, bolts and nuts, pig iron, etc.

Riehle Division, American Machine & Metals, Inc., New York. (Booth F-8)

Exhibiting: Hardness testing machines.

The Riverside Metal Co., Riverside (Burlington County), N. J. (Booth F-10.)

Exhibiting: Beryllium copper in the form of sheet, strip, bars, and blanks together with a wide variety of applications. Up-to-date information on this heat-hardenable alloy will be available in printed form and attendants will be qualified to answer questions concerning this metal.

Phosphor bronze and nickel silver products and full information will also be available on these alloys.

In attendance: H. L. Randall, president; J. F. Hackett, vice president and general manager; R. J. Wheeler, metallurgist; H. S. Freynik, metallurgist; J. C. Blake, sales department; and J. V. Hackett, production department.

John A. Roebling's Sons Co., Trenton, N. J. (Booth A-11)

Exhibiting: Wire rope and miscellaneous wire.

Rustless Iron & Steel Corp., Baltimore. (Booth A-22.)

Exhibiting: Stainless steel bars and wire and products manufactured from these alloys.

Jos. T. Ryerson & Son, Inc., Chicago, Ill. (Booth B-9.)

Exhibiting: Ryerson certified steels.

In attendance: Greswold Van Dyke, manager specialty steel dept.; W. O. Springer, specialty steel Dept., Cleveland; Chas. C. Bray, specialty steel dept., Philadelphia; J. W. Queen, specialty steel dept., Jersey City; Herbert B. Briggs, specialty steel dept., Boston.

Safety Gas Lighter Co., Lynn, Mass. (Booth B-36.)

Exhibiting: Demonstrating use of round-file gas lighters for welders' use and household appliances, also other types of hand gas lighters, stationary ignition equipment, and exhibit showing origin and development of gas lighters from inception in 1901 to present day.

In attendance: K. P. Hill, vice-president, in charge.

George Scherr Co., New York, N. Y. (Booth D-76)

Exhibiting: Optical instruments and testing machines.

Seymour Mfg. Co., Seymour, Conn. (Booth F-92)

Exhibiting: Nickel, silver, phosphor bronze, sheets, blanks, wire, rods, shells, etc.

Steel City Testing Laboratory, Pittsburgh, Pa. (Booth F-18)

Exhibiting: Testing machines.

Stoody Co., Whittier, Calif. (Booth H-88.)

Exhibiting (in operation): A natural color motion picture film equipped with sound. Also hard-surfacing material.

In attendance: J. R. Spence, metallurgist; W. M. Grant, secretary; and G. F. Staley, advertising department.

Taylor Hall Welding Corporation, Worcester, Mass. (Booth H-75.)

Exhibiting: One 17-KVA. spot welding machine Type E-10 in conjunction with Paramount Oilless Bearing Co., Inc., who are exhibiting one Oilless Bearing demonstrator.

In attendance: Preston M. Hall, president. In attendance for Paramount, George R. Johnson, president.

The Timken Roller Bearing Co., Steel & Tube Division, Canton, Ohio. (Booth E-48.)

Exhibiting: Numerous products made from Timken steel and parts made from Timken graphitic steel.

The Titanium Alloy Mfg. Co., Niagara Falls, N. Y. (Booth F-76.)

Exhibiting: Samples of Titanium alloys and Zircon refractories. Photographs and actual castings showing the structure of Titanium treated steel, cast iron, and aluminum.

Una Welding, Inc., Cleveland, Ohio. (Booth G-22.)

Exhibiting: Una welding rod (shielded and unshielded), Una automatic head, Una shielded arc automatic process.

In attendance: A. A. Probeck, W. K. Cooper, Carl Schaub, Bob Kyle.

Union Carbide and Carbon Corp., New York. (Booth H-52)

Exhibiting: Welding and cutting equipment, ferro-alloys, heat and corrosion resisting alloys (Refer to descriptions—Linde Air Products Co., Haynes Stellite Co., Electro-Metallurgical Co.).

United States Steel Corp., New York. (Booth, stage)

Exhibiting: Alloy steels, high tensile steels, stainless steels. (Carnegie-Illinois Steel Co. will exhibit several interesting applications of welded fabrication. American Steel & Wire Co. will exhibit welding rods and electrodes.)

Universal Cyclops Steel Corp. (Booth H-84.)

Tool steels, stainless and specialty steels.

Vanadium-Alloys Steel Co., Latrobe, Pa. (Booth G-32)

Exhibiting: Vanadium steel, tool steels.

Vanadium Corp. of America, New York. (Booth H-20)

Exhibiting: Vanadium alloys and compounds.

Welding Engineer Publishing Co., Chicago. (Booth A-42)

Exhibiting: Publications.

In attendance: Ralph S. Kenrick, editor; L. C. Monroe, advertising manager; T. E. Depew, eastern representative.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. (Booth E-19.)

Exhibiting: Complete line of a-c, or transformer welders (demonstrated). Automatic seam welder. M-g or flex-arc welders (demonstrated). Ignitron or seam welding controller (demonstrated). Electroplater using Westinghouse Rectox. Kovar. Konel (glass blower to demonstrate). Cupaloy die and hard press (demonstrated). Phos-copper (demonstration of brazing). Hipernik.

In attendance: T. E. Simpers, W. R. Bernardi, J. B. Seastone, P. H. Grunnagle, E. H. Vedder.

Wilson Mechanical Instrument Co., Inc., New York. (Booth C-50.)

Exhibiting (in operation): "Rockwell" hardness tester; "Rockwell" superficial hardness tester for thin material and superficially hardened surfaces; adapters for hardness testing the inner cylindrical surfaces of rings and cylinders; and latest work support accessories for the "Rockwell" tester.

In attendance: V. E. Lysaght, sales manager; D. F. Sklar, development engineer; A. C. Wilkins, New York representative; R. B. Coleman, Philadelphia representative; and J. P. Roberts, Buffalo, Cleveland, Pittsburgh representative.

Wilson Welder & Metals Co., New York. (Booth E-62)

Exhibiting: Electric welding machines.

Wire Association. (Booth A-40)

Exhibiting: Educational exhibit.

Youngstown Sheet & Tube Co., Youngstown, O. (Booth A-63)

Exhibiting: Alloy steels.

Entertainment Being Planned For 18th Annual Meeting

Just as were locking up the forms and sending the September issue tc press, we received the following convention "flash" from Warner S. Hays, managing director of the American Welding Society:

"We are holding an informal President's reception on Sunday evening, October 17, 5:00 to 7:00 p.m. at the Hotel Traymore, Atlantic City, N. J. This reception will be in the Stratosphere Room, and will enable every one in attendance to obtain a good bird's-eye view of the famous boardwalk, beach and island. I am sure that this will be an experience that will be long remembered and will give the 'conventionites' a healthful dose of salt air and (we hope) sunshine.

"From Monday until Thursday special entertainment is planned for the ladies through the cooperation of the National Metal Exposition. All of this entertainment will be provided for the nominal sum of $2.50. The tentative program is: Monday—Luncheon or style show at the Ambassador Hotel. Tuesday—Motor trip and tea at the Country Club. Wednesday—Card party at the Crane Building, also fortune telling and other entertainment. Thursday—Roller chair ride and visit to 'net haul,' and of course the big dinner dance Thursday night. Also of interest to the convention ladies will be the visits to the boardwalk shops, which seem to appeal to them more than any other feature at Atlantic City."

New Equipment Developments

Eisler Engineering Announces Two New Spot Welders

Eisler Engineering Co., 749 So. 13th St., Newark, N. J., has recently announced two new spot welders. Unit No. 235-SLA is designed for the manufacture of metal doors and is made in various sizes depending on the nature of the material to be welded and the size of the doors. It is air operated and controlled by a foot switch. Great flexibility is claimed as well as ability to weld where space is limited.

The upper arm can be adjusted either lengthwise or horizontally and can be turned in any position. The lower arm is narrow to permit welding in corners, edges and narrow width doors. Both electrode holders are water cooled. Air-cooled type transformer is used and has a 24-point switch for adjustment. All parts are completely enclosed. The makers say that this machine is suitable for welding steel, iron, stainless steel, bronze, brass and aluminum.

The second machine, No. 235-SLO, is designed for welding materials that are veneered, lacquered, painted or coated on one side; the method is called overhead welding. Both electrodes come in contact with the metal on one side only, and welding the manufacturers say, is accomplished without burning or blistering the finished opposite surface.

The welder is 125 KVA. capacity, but is made in many sizes depending on the material to be welded. It is air operated with all controls completely enclosed including automatic timer and is easily operated by means of foot-operated switch and solenoid controlled air valve. Transformer is air cooled and has 24 points of current regulation. Table with rollers is provided to handle large sheets of metal with ease.

Quick-Change Speed Shifting On Jarvis Portable Grinder

A new method of changing the speed of a portable grinder, without shifting the belt, or without stopping the machine, is a feature of the Jarvis "Vario-Flex" power grinder made by the Charles L. Jarvis Co., Pease Ave., Middletown, Conn. It is claimed that by maintaining constant surface speed of grinding wheels, regardless of diminishing diameter of wheel, the user will obtain big savings of time and wheel costs on tough grinding and snagging jobs.

For example, a 10-in. vitreous wheel at 2200 r.p.m. has a surface speed of 5500 ft. per min. With the 14 speeds available in the Jarvis "Vario-Flex," the grinding wheel may be worn down to 4½ in., maintaining a constant peripheral speed. With the wheel worn to 4½ in. the operating speed would be about 4700 r.p.m. Other features of the "Vario-Flex" are: totally enclosed ball bearing motor, heavy cast iron base with large rubber-tired ball bearing wheels, 360-deg. movement of motor unit, heavy duty hand-piece with two double-row ball bearings. A catalog will be sent upon request.

Speed of Jarvis Vario-Flex grinder can be changed without stopping machine

New Line of Protective Clothing for Welders

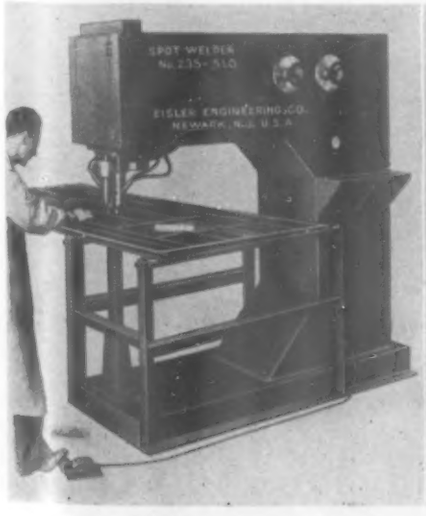
A new line of protective clothing for welders, complete for both gas and arc welding has been added to the comprehensive line of safety equipment of the Davis Emergency Equipment Company, Inc., 55 Van Dam St., New York City. The Davis line of protective clothing for gas welding comprises: goggles, sleeves, aprons, leggings, spats, and gloves. For arc welding, it includes: helmets, hand shields, sleeves, aprons, coats, pants, leggings, spats, and gloves.

The goggles, helmets, and hand shields are equipped with glasses of various shades, each suitable for a special type of work. There are 5 different shades of goggles, ranging in use from light brazing to heavy welding, and three different shades of glasses for helmets and hand shields,—for light and heavy metallic electrode work and for carbon arc work respectively.

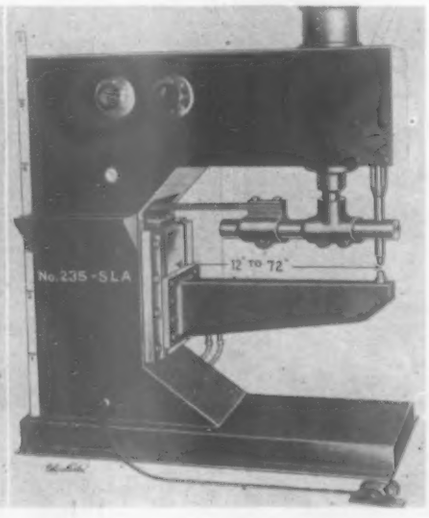
Davis protective clothing is supplied in three different materials—fire-proof duck, asbestos, and chrome leather. Chrome leather is, however, considered superior to the other two materials because it remains soft under heat and is much more durable.

All Davis garments are designed to afford the worker maximum ease

Overhead welding is used in this machine — Both electrodes contact the same side of the metal



Designed for fabrication of metal doors—Machine is air operated and foot controlled



while working. Garments for use in arc welding protect the body from the effects of ultra-violet light as well as from heat and sparks.

McKay Company to Make Electrodes

The McKay Co., York, Pa., has just announced a new division for making shielded-arc welding electrodes. An extensive new plant has been built, equipped, and put into production. Advaneed machinery and methods for the manufacture of a wide range of types and sizes of rod are installed for production under conditions that assure high quality through uniform control.

L. E. Faulkner is chief chemist for the new McKay plant; M. J. Van Dreser is sales engineer in charge of the McKay electrode sales and service staff, while T. J. McKay, Jr., is handling sales promotion. The company will be represented at the National Metal Congress in Atlantic City and will exhibit its products at Booth H-81.

One-Ton Welding Manipulator

Illustration shows a one-ton welding manipulator, for use in any shop where welded units are made. This is an entirely new design which affords many advantages in handling the job so that all welds can be made in the down-V welding position. It is being introduced by United Engineering & Foundry Co., Pittsburgh, Pa.

The face-plate can be tilted from a position of 45 deg. back underneath the vertical, around through the vertical to a position of 30 deg. beyond the horizontal, making a total tilting angle of 165 deg. In addition to the tilting angle, the face-plate may be rotated through 360 deg. in either direction, simultaneously with or independent of the tiltlting.

Both motions are individually power driven by separate motors and controls through self-locking worm units, which permit locating the face-plate in an infinite number of positions without the use of locking pins, clutches, etc.

The face-plate has many provisions for easily and readily mounting the work, such as tee-slots, through holes, tapped holes and means for supporting extension bars. With these manipulators the work can be easily handled for the placing of all welds in a down-V welding position.

All Metal Solder and Flux for Various Applications

The Imperial Brass Mfg. Co., 522 So. Racine Ave., Chicago, Ill., has developed a new high tensile solder and all-metal flux for low temperature application for such uses as breaks in gasoline engine heads, blocks and crank cases, pipe fittings, etc. In addition to iron products it can be applied to aluminum, stainless, monel and die cast metal, it is claimed.

Advantages claimed by the manufacturer are that it has tensile strength of over 10,000 lbs., psi.; it can be machined, polished and plated; it will withstand hydrostatic pressure of 100 lbs. and can be used for steam lines where temperatures do not exceed 350 deg. F. Application can be made with a blow torch, welding torch or large soldering iron. It is furnished in kits of various sizes together with a bottle of flux and detailed instructions for application.

Wilson Yellow Jacket Pipe Line Welder

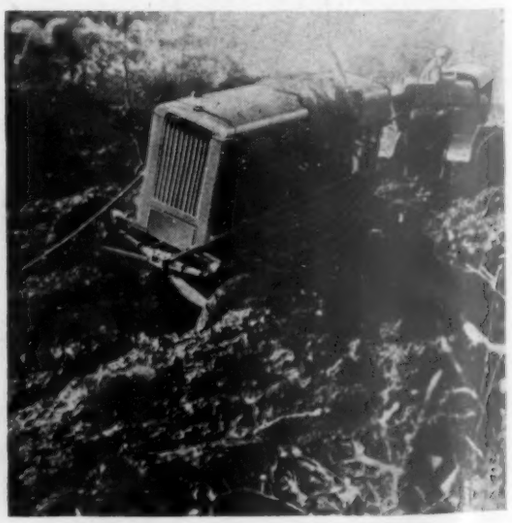
A new electric welding machine designed exclusively for pipe line work has been announced by the Wilson Welder and Metals Co., Inc., 60 E. 42nd St., New York, N. Y.

It is obtainable in 300 and 400 ampereage capacities and distinguished by its color and the name "Yellow Jacket." Conditions surrounding pipe line welding are such as to call for welding equipment designed and built expressly for the purpose. With this in mind, the Wilson company say they have constructed their machine with a ruggedness far beyond that which is needed in less rigorous work. Weather contingencies and circumstances of field operations have been carefully studied and all problems encountered have been taken into consideration in its design, the makers claim.

New features, which contribute to dependability under these conditions, are: double sediment collectors for carburetor supply; improved foolproof idling device; thirty-six gallon gasoline tank and improved current switch. Other features are: close coupled design; a lowered center of gravity of one foot; light-weight reinforced base and framework; center lifting bail; double-radiator protecting grill.

The distributor and other parts are easily accessible and for operating purposes two hinged panels are placed on each side, thereby permitting instant and easy access to all controls. Optional equipment includes either battery or magneto ignition.

Power-driven welding positioner has two individually-controlled motors



Yellow Jacket welder being pulled out of deep mud in a pipe welding job

Industrial Plating Brought to the Job by New Device

A portable electroplating machine has recently been introduced for industrial work by Nickel-Chromium Plating Corp., 3429 West 47th St., Chicago. This new machine is known as the Connecticut Portable and is being marketed in several sizes. Essentially, the plating machine is a device for applying a low-voltage direct current to a special plating brush which is applied to the work much the same as a paint brush.

The brush method eliminates the heavy labor expense involved in removing machine parts for replating. Some of the possible applications are plating of corrosion-resisting metals such as tin, cadmium and zinc. Another application is silver plating copper bus bars and contact points on electrical panel boards, where corrosion of copper is a problem. It is claimed that plating by the brush method is very economical.

Type IE-4 machine is a complete plating and buffing unit

Another suggested application of the Connecticut Portable machine is the plating of hard metal to resist abrasion. It is claimed, for example, that carbon steel and high-speed alloy steel reamers used in machining aluminum alloys can be hard plated for longer life. Production gauge equipment, after suitable hardening and tempering can be hard plated to a depth of about .0015 in. It is further claimed that when expensive gauges become worn, they can be hard plated and refinished to correct size at a mere fraction of the cost of new gauges.

Airco Develops New Alloy Steel Rod

Air Reduction Sales Company has developed a new gas welding rod, the Airco No. 1 High Ductility Alloy Steel. It has been designed to meet the present day demand for increased ductility and general improvement in quality of both single and multi-layer steel welds.

An outstanding feature of the Airco No. 1 Rod is its ability to withstand considerable heating without burning. In this important respect it is in a class by itself. Every test has shown it to be the ideal rod on which to standardize for all steel pipe and plate welding, both light and heavy. An examination of the physical characteristics of the new rod discloses the following:

(1) Free bend ductilities of single layer welds, range from 20% to 30% depending upon the composition of the steel.

(2) Free bend ductilities of multi-layer welds, up to 40% on low and medium carbon steels.

(3) Ultimate tensile strengths in excess of 60,000 lb. per sq. in.

(4) Specific gravity of welds, 7.80—7.86.

(5) Charpy impact values on key-hole notched specimens at 70°F., from 15 to 30 ft. lb. .

(6) Rockwell hardness of weld metal from B60 to B85, depending on carbon content of base metal and type of weld.

The brush acts as one electrode in the Connecticut portable plater

Miller A.-C. Welder Has Dial Controls

An A-C. welder with separate voltage and amperage controls, enabling the operator to select the most desirable voltage for the current used on any job, has just been put on the market by Miller Electric Manufacturing Co., Appleton, Wis. This welder, known as "Dual Control" furnishes very flexible current settings. It is easy to operate; the three dials on the front of the cabinet are plainly marked, and it is compactly but heavily constructed for hard usage.

Built in three sizes with a current range from 10 amp. up to maximum output this machine makes possible welding of sheet metal or heavy metal. This welder is equipped with wheels so as to be portable as a truck. All three sizes have the same cabinet dimensions and vary in weight from 235 lbs. to 350 lbs. Furnished standard for 220 volts.

Ludlum Introduces New Hard-Surfacing Electrodes

A group of new ferrous-base alloys in the form of electrodes for hard surfacing has been announced by Ludlum Steel Company, Watervliet, N. Y. Deposits of each alloy possess physical properties and characteristics which are particularly adapted to resist one of the three main forms of mechanical wear.

The Ludlum alloy electrodes are said to be markedly different in composition from any other welding materials heretofore available. An important and distinctive feature of these alloys is that high degrees of hardness and abrasion resistance are obtained without the presence of a high percentage of carbon. The re-

quisite physical properties are developed through the use of appreciable amounts of boron in combination with certain other alloy elements. Weld metal deposited with these electrodes is not only hard and wear resistant, but, it is claimed, also highly resistant to impact or compression frequently encountered in industrial operations. The Ludlum hard-surfacing electrodes comprise three different alloys:

The electrode designated as Ludlum LC-60 contains molybdenum, tungsten and boron as essential alloy elements, and the LC-50 alloy contains chromium, molybdenum and boron. The LR-40 alloy contains tungsten, chromium and minor amounts of boron, manganese and silicon. The maximum carbon content of each alloy is approximately 0.35 per cent.

Hardness of 725 Brinell .

Deposits of the molybdenum-boron alloy on low-carbon steel have an average hardness of 725 Brinell. This alloy is used on operations imposing excessive abrasive wear, regardless of the amount of impact or compression.

Deposits of the chromium-boron alloy on 0.25 per cent carbon steel have a hardness of 625 Brinell. This alloy is used on operations imposing an intermediate degree of abrasive wear, particularly when such wear is normally accelerated by an appreciable amount of impact or compression.

Hardness of 525 Brinell

Deposits of the tungsten-chromium-boron alloy on 0.25 per cent carbon steel have an average hardness of approximately 525 Brinell. This alloy is intended for use on a wide range of operations imposing a high degree of impact or compression, which may or may not be accompanied by some abrasive wear. Although deposits of this alloy have a relatively high degree of hardness, it is not intended primarily for general hard surfacing. This alloy provides a satisfactory material for building up worn metal parts and forming a base for either of the other two alloys. This electrode can be successfully applied on all carbon steels containing less than approximately 1 per cent carbon as well as on a wide range of alloy steels and 14 per cent manganese steel.

These electrodes are now being employed on a wide range of industrial operations. Some of the general fields include agricultural implements, automobile manufacture, aviation, brick mills, cement mills, dredging, excavating and quarrying equipment, glass manufacture, iron and steel mills and fabricating plants, non-ferrous fabricating plants, coke plants, coal mining, metal mining, light and power plants, lumber industry, machinery manufacture, oil industry, railway track maintenance, locomotives, pulverizer and hammer mill installations in various industries, road-building machinery, woolen and textile mills, and a long list of miscellaneous applications.

An interesting and important use of the LC-50 alloy is the hard surfacing of manganese steel castings which are exposed to an appreciable amount of abrasion as well as impact. The service life of many forms of equipment, such as dredge bucket teeth, certain areas of buckets, hydraulic cutter blades, liners of centrifugal pumps, drag line teeth, and many other forms of manganese steel, can be materially increased through the use of this alloy.

New Electric Soldering Tool

Although soldering by electricity is not new, the method of soldering or heating with electrically heated pliers such as the Thermo-Grip Pliers recently introduced by the Ideal Commutator Dresser Co., 4012 Park Ave., Sycamore, Ill., is new. This new method enables the operator to grip and hold the objects securely, while heat is being applied, thus obviating the necessity of make-shift methods of holding two pieces of metal together while working. Another advantage of Thermo-Grip Pliers is that they sweat joints without unsweating adjacent connections.

Heating is rapid and satisfactory, because heat is applied on both sides of the work at the same time. The tool draws current only when in actual use and in contact with the metal. Line voltage from which this tool operates is reduced to a harmless low voltage. There is no danger from electric shock to the operator.

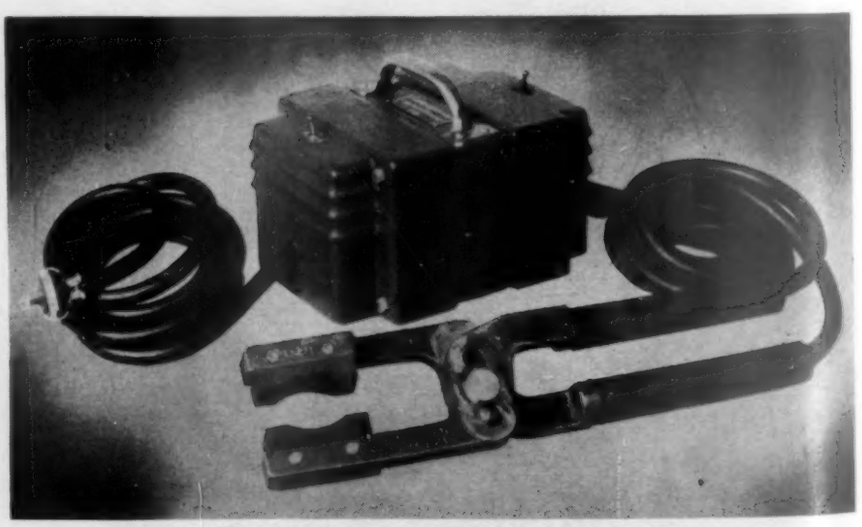
Two sizes of pliers are available—the Ideal No. 5 model for small soldering work, and Ideal No. 10 which will do work over twice the size for which No. 5 is used. The larger No. 10 size pliers are used for soldering lugs up to 1,050 amp. or sweating pipe fittings up to 2½ in. diameter, under continuous operation. When used only intermittently, the No. 10 Pliers will handle pipe or fittings up to 4 in. diameter. The small No. 5 size is intended for soldering lugs up to 400 amp. or sweating pipe fittings up to 1 in. diameter.

New Type Regulator Added to Victor Line

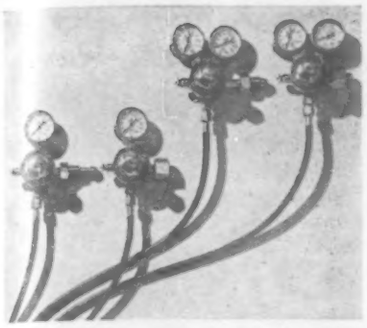
Believing that there exists a very large demand for a smaller and less costly regulator, Victor Equipment Company, San Francisco, Calif., already producing eight different types of regulators, are now ready to market their new Type "SVJ" regulator.

This regulator is, furthermore, designed to answer the need for an accurate auxiliary pressure reducing device which may be directly attached to a great many equipments for operating or utilizing compressed air.

Among the outstanding advantages of this regulator are its great compactness, its accessibility, its design simplicity and the fact that it is manufactured of bronze die forgings. The regulator is equipped with



Electrically-heated pliers draw current only when in actual use



Type "SVJ" regulator features compactness, design simplicity and self-reseating pressure relief valve

an adjustable "self re-seating" pressure relief valve. The regulator tension screw is provided with a large polished stainless steel ball and point.

With exceptionally large gas volume and accurate pressure maintenance for a small size regulator, this new device, procurable either with two gauges or with one gauge, is a sturdy, accurate and safe device. It is moderately priced.

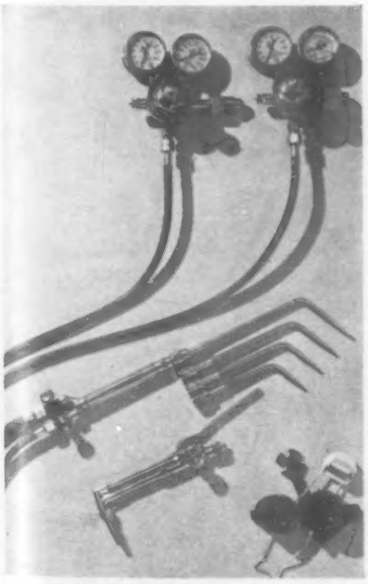
Victor Combination Welding and Cutting Unit

For the garage, sheet metal shop, repair shop and wherever an efficient light weight combination cutting and welding unit is of advantage, Victor is now offering a new unit—the No. SV-100.

This unit is comprised of a new standard Victor welding torch of slightly smaller size and equipped with four nozzles, each of which, in compliance with Victor principles, is provided with its individual patented "Spiral Mixer." An efficient and carefully manufactured cutting attachment No. 500 with tip, instantly fits the welding torch head.

New type "SVJ" double gauge regulators of adequate capacity and pressure accuracy, together with oxygen and fuel gas hose, goggles, spark lighter and necessary wrench —complete this efficient unit. The unit so supplied offers a welding range from very light sheet metal to beyond ¼ in. thick and permits easy cutting of metal up to 3 in.

Type SV-100 light-weight cutting and welding unit has four nozzles



Operating Economies of New A. C. Welder

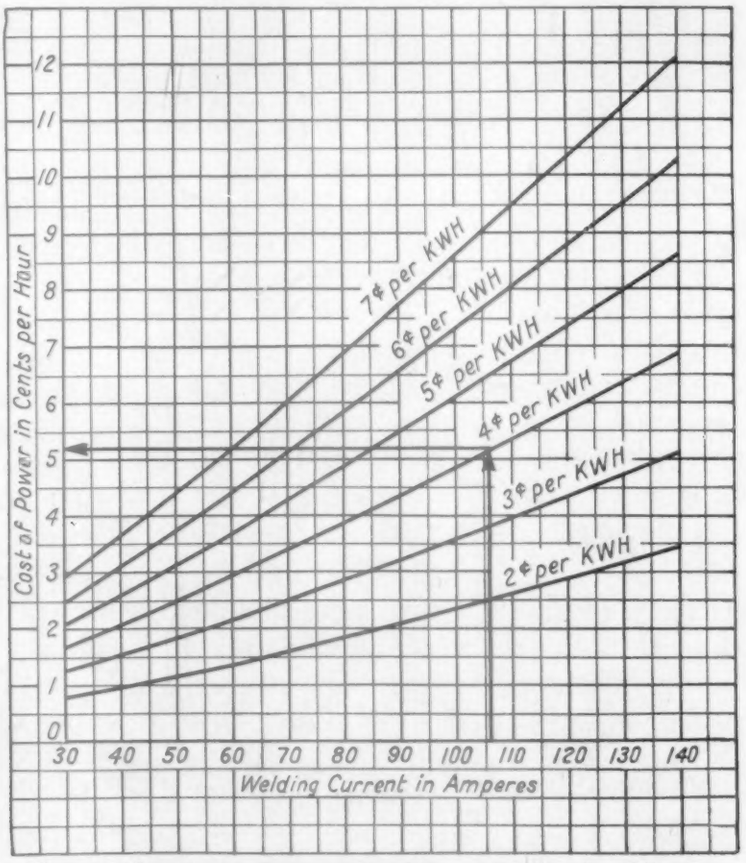
Based on the service records of many Westinghouse Midget Marvel A-C. welders now in service, it has been demonstrated that operating costs are low in the field of light fabricating and repair work. In addition to being extremely portable and safe in operation, these sets have average efficiencies as high as 87 per cent based on welding operation of one-third of total time. The high efficiency of the set and the very low, no-load loss—less than the power taken by a 100-watt lamp —combine to give low power cost.

The curves show the cost of power in cents per hour for various power rates and welding currents when working on a one-third duty cycle. For example, when welding with a current of 106 amp. and a power rate of 4 cents the arrow on the chart shows an operating cost of 5.2 cents per hour.

The current range for welders is from 30 to 140 amp. in twelve steps of current adjustment. All primary windings are arranged for either 110 or 220-volt connections. When welding at 140 amp. the primary input is 70 amp. at 110 volts and 35 amp. at 220 volts. The current is proportionally lower when welding at lower currents. Coated electrodes from 1/16 in. to 5/32 in. diameter are used with these welders.

Arc-Wel Coated Electrodes For Cast Iron Welding

Northeast Metals Company, 4124 Torresdale Ave., Philadelphia, Pa. is introducing a flux-coated non-ferrous welding electrode under the name "Arc-Wel." This new electrode is especially suited for soft machinable welds in cast iron. Other advantages claimed are: absolutely no preheating, complete fusion with cast iron, smooth quiet arc, no sputtering. These rods are packed in cartons of 50 each. Rod size is 5/32 in. diameter, 18 in. long.



Curves showing average operating costs for the Westinghouse Midget Marvel A-C. welder

A New Editor Goes to Work

Ralph S. Kenrick

WITH the publication of the September, 1937 issue, *"The Welding Engineer"* announces an important change in its editorial staff. RALPH S. KENRICK has been appointed editor to succeed F. L. SPANGLER, who has resigned to assume new editorial responsibilities with another business publication. M. S. HENDRICKS has been appointed associate editor.

RALPH S. KENRICK, new editor of *"The Welding Engineer"*, started his business paper experience in 1924 with a position on the editorial staff of the Simmons-Boardman Publishing Company, Chicago. His duties as associate editor were devoted principally to "Railway Signaling" and "Railway Electrical Engineer", both monthly business papers. Part of his time was spent on editorial work for "Railway Age", a weekly business paper.

Leaving Simmons-Boardman in 1930, Mr. Kenrick joined the A. C. Nielsen Co., Chicago, industrial market analysts. The next two years were devoted principally to field research and editorial reports dealing with industrial markets—defining markets, evaluating buying influences, and checking buyers' preferences.

In 1933, Mr. Kenrick joined the advertising department of Swift & Company, Chicago, and continued with this company until his present appointment. His work for Swift & Company embraced marketing research, dealer promotion, merchandising surveys, and statistical work in the advertising department.

Mr. Kenrick is an electrical engineering graduate of Armour Institute of Technology, Class of 1922. While attending Armour Institute, he was elected to membership in Tau Beta Pi honorary engineering fraternity, and Eta Kappa Nu honorary electrical engineering fraternity. He also took special training in market research and advertising at the University of Chicago, 1931-33.

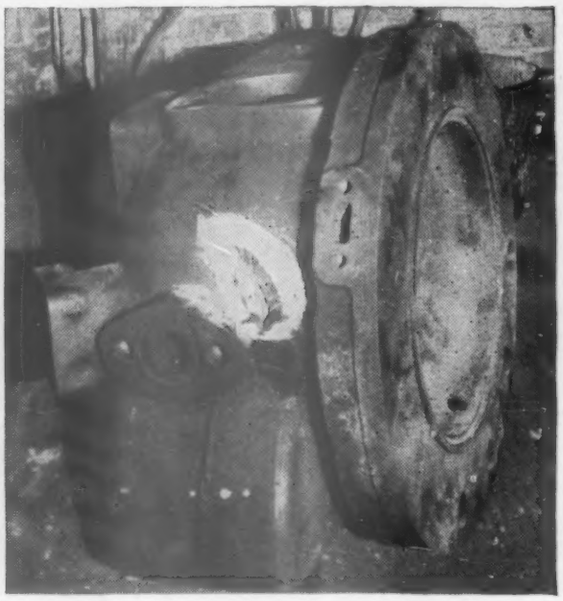
M. S. HENDRICKS, newly appointed associate editor, received his initial editorial experience as managing editor of the "Acetylene Journal" from 1927 to 1931. In the latter year the "Acetylene Journal" was absorbed by *"The Welding Engineer"* and Mr. Hendricks became a member of the editorial staff of *"The Welding Engineer"*. He left in 1932 to engage in advertising and selling, but has just recently returned to our editorial staff as associate editor. Mr. Hendricks obtained engineering training at the University of Wisconsin, 1924-25.

$2,000 replacement cost

Saved by Tobin Bronze!

2 cracked Diesel engine heads repaired "like new" in short time and at small expense

Water jacket repair is shown above



Valve port was welded as shown here

HERE is how one pound of Tobin Bronze in less than two hours saved $2,000 and weeks of delay. Cracks in these two Diesel engine heads developed—one on the outside of the water jacket and the other on the inside of a valve port.

A welding operation with one pound of Tobin Bronze and 28 feet each of oxygen and acetylene did the job. In less than two hours, these four hundred pound castings were repaired. After the valve seats were ground, the heads were put back in service. *New heads would have cost $1,000 each and would have meant weeks of delay because the castings were made abroad.*

This is another of many instances where Tobin Bronze welding has saved money and time for plant owners. It confirms the verdict of experienced welders that Tobin Bronze is a *better* welding rod.

Tobin Bronze carries the trademark "Tobin Bronze Reg. U.S. Pat. Off." on each rod. Look for it. Be sure you are getting the genuine Tobin Bronze.

87267

ANACONDA
from mine to consumer

Anaconda Welding Rods

THE AMERICAN BRASS COMPANY • General Offices: Waterbury, Connecticut

Offices and Agencies in Principal Cities • In Canada: ANACONDA AMERICAN BRASS LTD., New Toronto, Ont.

News of the Industry

HOWARD V. HARDING, who since 1927 has been chief engineer of Peter Clark, Incorporated, New York City, has become associated with LUKENWELD, INC., division of Lukens Steel Company, Coatesville, Pa., as district sales manager in the metropolitan territory. He will make his headquarters at 120 Liberty St., New York. Mr. Harding was born in Framingham, Mass., in 1896, and started his business career in 1914 with the Hyde Windlass Company, Bath, Me., as machinist's apprentice. In 1919, Mr. Harding joined the Mead-Morrison Company, Boston, and in 1921 became associated with Gifford Wood Company, Hudson, N. Y., where until 1927 he was engaged in the design of materials-handling equipment.

Howard V. Harding

While with Peter Clark, Inc., builders of mechanical stage equipment, Mr. Harding designed the hydraulic stage lifts for several large theatres.

THE GENERAL WELDING CO., Pittsburgh, Pa., of which D. O. Smith is president, recently constructed a blank gear wheel entirely by welding. It was necessary that the customer have the wheel within twenty-four hours and, because of the great activity in the foundries of that city, officials of the company learned that such a casting could not be made and delivered for six or eight weeks.

The wheel was constructed from a steel rim, 30 in. in diameter, a small steel hub of correct size, and six spokes, cut from steel plate. The spokes were welded to the rim and to the hub, making a gear which was stronger than if it had been cast.

THE 26TH NATIONAL SAFETY CONGRESS and Exposition Oct. 11 to 15 in Kansas City, Mo., will have more than 400 speakers who will discuss accident prevention in many fields. There will be subject sessions on after-work accidents, agricultural safety, fire prevention, industrial dusts, community safety organization, health service in industry, pressure vessels, and other up-to-the-minute topics.

THE NEW FILLER METAL SPECIFICATIONS just released by the American Welding Society are mute evidence of the long road of progress in improved quality of weld metal which may be expected from modern filler materials. 80,000 lb. per square inch ultimate with a elongation of 20 per cent in 2 in. is "good" weld metal. Other requirements such as "free bend," "nick-breaks" and "density" are equally high.

THE MONTHLY RESEARCH REPORT of the American Welding Society is devoted to "Corrosion Resistance of Welded Joints." The whole world was literally combed for test results and service experience dealing with the corrosion of welds in carbon and alloy steels and many of the non-ferrous metals. In some cases the welds stood up better than the base metal.

UNITED STATES STEEL CORP. has had a crew of 21 Hollywood camera men and technicolor experts busy for several weeks taking shots in 20 of its plants covering the entire operation of the manufacture of steel. Starting out at the Iron Range at Hibbing, Minn., miners are shown taking out the raw ore. Giant ore boats are shown being loaded at Duluth and later being unloaded in the harbor at Gary Works. Footage has been given to Bessemer converters in operation, loading open-hearth furnaces and finally manufacture of finished iron and steel products such as wire, fencing, nails and similar products.

Actors in the picturization of the romance of steel are all employees of United States Steel Corporation subsidiaries. No professional actors are used and each man is shown doing his everyday work. Three versions of the picture are being produced. Two are in technicolor and sound and will be distributed to theatres, clubs, engineering societies and other groups. The third film is a long black and white version for educational purposes.

A. W. S. Activities

CHICAGO SECTION, American Welding Society, held its opening meeting of the 1937-38 season on September 17 at the "Skytop Roof," 185 North Wabash Ave. LEON C. BIBBER, welding engineer for Carnegie-Illinois Steel Corp. discussed the new A.W.S. welding symbols. Several well-known welding experts were present to ask questions, offer comments and contribute to the discussion. Mr. Bibber took a very active part in the committee which formulated the new welding symbols. WARNER S. HAYS, managing director of the American Welding Society, described the work now being done by the Society in building up its membership.

NOMINEES for the different offices of the Pittsburgh Section, American Welding Society, are as follows: Chairman, Leon C. Bibber, welding engineer, Carnegie - Illinois Steel Corp., and H. S. Card, Electric Welding Section, N.E.M.A.; Vice-Chairman, J. O. Rinek, vice-president, Universal Steel Corp., and Robert E. Cecil, vice-president, Wm. B. Scaife & Sons Co.; Secretary, J. F. Minnotte, secretary-treasurer, Minnotte Bros.

Hollywood camera crew filming open hearth furnace

Save those $ $ $ $ $

By Flame Cutting with the

C.I.G. GAS-O-GRAPH

The Gas-O-Graph will accurately flame cut almost any shape, no matter how intricate, from steel plates or billets. For use with either one or more oxy-acetylene cutting torches, the Gas-O-Graph will cut any metal that can be cut by the oxy-acetylene process, with a speed and accuracy that is surprising in a machine so low in cost.

The Gas-O-Graph—weighing only 50 pounds—can be carried easily by one man. Cuts are made so cleanly that machining is seldom required.

Priced at only $250.00 complete with 5-foot 8-inch rail and radius cutting attachment, the C.I.G. Gas-O-Graph will provide a ready solution for your mechanical flame-cutting problems. An illustrated circular will be furnished upon request.

Available At 33 C.I.G. offices and through distributors

Strategically located throughout the United States are C.I.G.'s thoroughly modernized oxygen, hydrogen and acetylene plants, serving these 33 distributing points and providing a quick and reliable source of supply for gases used in the welding and cutting of metals. In addition to its gases, C.I.G. can also furnish a complete line of gas and electric welding and cutting equipment and supplies—a single source of supply for literally everything for welding and cutting. A staff of thoroughly trained and competent welding engineers and metallurgists are ever ready to assist you.

HAVE YOU SEEN THE C.I.G. PIPE CUTTING AND BEVELING MACHINE?

If you haven't, call your nearest CIG office for a demonstration. For here's a machine that is unsurpassed in the cutting and beveling of pipe.

Three standard sizes of machines will cut pipe ranging from four to twenty inches in diameter. Machines for larger pipe are available.

A complete cut and bevel can be made in a 12-inch pipe in ABOUT TWO MINUTES.

When two torches are used, a weld can be cut from a section of pipe leaving the two ends of the pipe beveled, ready for re-welding.

A complete cut can be made in a section of pipe without moving or resetting the machine.

A Descriptive Folder is Available Upon Request.

COMPRESSED INDUSTRIAL GASES, INC.

EXECUTIVE OFFICES: 221 NORTH LA SALLE STREET, CHICAGO, ILLINOIS

CIG

If It's for Welding or Cutting — We Have It!

Co.; Representative on National Board of Directors, W. W. Reddie, Westinghouse Elec. & Mfg. Co.

PITTSBURGH SECTION, AMERICAN WELDING SOCIETY, will hold its first meeting of the 1937-38 season, Wednesday evening, Oct. 13, in the Roosevelt Hotel, Pittsburgh, according to an announcement by J. F. Minnotte, secretary. Speakers at the meeting will be A. E. Gibson, president of the American Welding Society, and Warner S. Hays, managing director of the society.

DETROIT CHAPTER of American Welding Society will resume fall and winter activities with a meeting on October 8 at 8 p. m. Walter Anderson, vice-president of Taylor-Winfield Corporation, Detroit, and Jack Gordon, manager of the fabricating division of Taylor-Winfield Corporation, Warren, Ohio, will be speakers.

The December meeting will be held at Flint, Mich., on December 8, and will be held in conjunction with the Society of Automotive Engineers. Speakers for this meeting will be Professor Comfort A. Adams of Harvard, and E. I. Larsen of the P. R. Mallory Co., Indianapolis, Ind.

OKOCORD

Extra Flexible

WELDING CABLE

• A welding cable in active service receives a terrific amount of abuse. It is dragged over rough surfaces, around sharp corners and often is run over by trucks, wheelbarrows and other vehicles.

That is why Okocord Welding Cables are built with a tough durable tire-like sheath. This sheath gives ample protection to the conductors, but does not destroy the extreme flexibility of Okocord. This combination of toughness and flexibility makes Okocord the perfect welding cable.

THE OKONITE COMPANY

Founded 1878

and

HAZARD INSULATED WIRE WORKS DIVISION

THE OKONITE-CALLENDER CABLE COMPANY, INC.

EXECUTIVE OFFICE: PASSAIC, N. J.

New York, Boston, Chicago, Detroit, Philadelphia, Pittsburgh, Washington, San Francisco, Los Angeles, Seattle, Buffalo, Dallas, Atlanta

Factories: Passaic, N. J., Wilkes-Barre, Pa., Paterson, N. J.

Construction News

ERMAN-HOWELL & CO., INC., 332 S. Michigan Blvd., Chicago, Ill., have completed a welding contract for 250 car sets, of four frames each, for the General American Tank Car Corp.

Ten all-welded steel hopper barges recently were completed for the Pittsburgh Coal Co., Pittsburgh, Pa., by the TREADWELL CONSTRUCTION CO., Midland, Pa. The barges are 175 ft. long, 26 ft. wide and 11 ft. deep. Each barge weighs 150 tons and has a capacity of 1,000 tons. About 12,000 lineal ft. of welds were necessary in building each barge.

THE BETHLEHEM STEEL CO., Pittsburgh, Pa., has completed an order for 3,000 tons of all-welded steel pipe for use in connection with the water supply system of Toledo, Ohio. The pipe, which is 48 in. in diameter and of carbon arc-welded construction, was treated in a rather interesting manner for ground and water erosion. The exterior of the pipe was coated with tar enamel, while the interior was spun with a cement lining, the cement being sprayed in place.

THE DRAVO CORP., Pittsburgh, Pa., has been awarded a contract by the Kieckhefer Container Co., Delair, N. J., for the construction of an all-welded hopper type barge. This barge, with a capacity of approximately 2,000 tons, is to be 255 ft. long, 40 ft. wide and 14 ft. deep. It is especially designed to carry baled wood pulp from Plymouth, N. C., to Delair, N. J. The plates will be fabricated at the Neville Island yards of the company in the Pittsburgh district and shipped to Wilmington, Del., for assembly.

H. C. PRICE CO. of Bartlesville, Okla., has been awarded contracts for electric welding and has started construction on the following pipe lines:

From Ligon & Ligon—45 Miles of 12-In. line in West Virginia for Godfrey L. Cabot, Inc.

From Standard Oil Company of Ohio—37 Miles of 6-In. line from Fostoria, O., to Toledo.

From Kelly-Dempsey Company—64 Miles of 6-In. line from Cleveland, O., to Canton for the Standard Oil Company of Ohio.

From B & M Construction Corp.—52 Miles of 8-In. and 10-In. line in Illinois for the Pure Oil Company.

From Williams Brothers Corp.—142 Miles of 6-In., 8-In. and 10-In. line

New home of C. E. Phillips & Co. houses a permanent display of welding equipment

in Louisiana for the Standard Oil Company of Louisiana.

From Ford, Bacon & Davis Construction Corp.—Four 10-In. lines across the Mississippi River near Yazoo City, Miss., for the Southern Natural Gas Company.

All of the above lines are to be electric welded, using the Fleetweld process.

Trade News

C. E. PHILLIPS & Co., welding equipment distributors in Detroit, have just moved into their new home at 2750 Poplar St. Expansion of business made it necessary to move into larger quarters. They have over 7000 sq. ft. of floor space in their new building, which houses a permanent and complete display of Westinghouse electric welding machines, both A. C. and D. C., including an automatic arc welding unit. This equipment is hooked up ready for instant demonstration. This distributor also handles the Stoody line of hard-facing electrodes and rods, and other welding specialties.

THE HARNISCHFEGER CORP., Milwaukee, Wis., has recently remodeled its Hercules Steel Castings Plant into a modern welding electrode factory. P & H electrode research laboratories are already set up and almost the entire plant will be devoted to the manufacture and improvement of Smootharc welding wire under the direction of J. C. Joublanc, chief metallurgist.

Recently issued bulletins describing the Smootharc Welding Electrode, as well as P & H-Hansen Smootharc Welders may be obtained from the nearest P & H distributor or by writing the Harnischfeger Corp., 4613 West National Ave., Milwaukee, Wis.

THE LINCOLN ELECTRIC CO., Cleveland, Ohio, announces the opening of a new sales engineering office at 400 North St., Bluefield, West Virginia. The new office will be in charge of WM. H. SCHUSTER, who for the past year, has been assistant welding instructor in the Lincoln Welding School at Cleveland. He will maintain welding consultation and supply service for the coal fields of West Virginia, Virginia and Kentucky.

ADAMS Offers a Complete Line of Arc-Welding Equipment

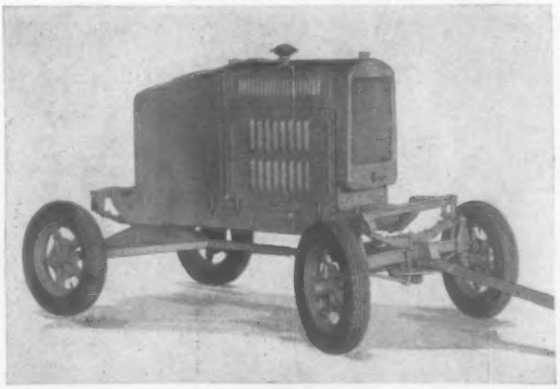
WHETHER your need is for welding machines, electrodes or welding accessories, Adams can supply your needs from a line which offers many exclusive features. A request on your letterhead will bring complete descriptive catalogs on any of the following items:

Adams Vertical Welders. Vertical design offers several advantages. DC machine available in 200, 300 and 400 ampere sizes; AC model in 300 and 500 ampere sizes.

Automatic Welding Heads and Wire. Outstanding equipment suitable for use in connection with any automatic welding set-up. Head has many desirable features.

Engine Driven Welders. Ideal for shop or field work. Available in 200 and 300 ampere models mounted on steel skids or trailer as illustrated below.

Adams vertical design in welders has distinct advantages. Let us tell you about them.



ELECTRODES

Adams offers all kinds of bare, processed and heavy-mineral-coated electrodes for the welding of mild steel, stainless steel, manganese steel and aluminum. . . . Tell us what you weld and let us send samples of the electrodes best suited to your work.

J. D. ADAMS COMPANY • INDIANAPOLIS, INDIANA

★ *Welding Division* ★

THE LINCOLN ELECTRIC CO., Cleveland, Ohio, announces it is now providing arc welding users in Sacramento and the central valley of California, complete arc welding sales and engineering service. The Lincoln Sacramento representative is WILLIAM F. FISCHER, address—1241 32nd Street.

Announcement is received from The Lincoln Electric Co., Cleveland, Ohio, of the opening of a new sales engineering office at Dayton, Ohio under the direction of R. P. SHARER and will be located at 1508 Watervliet Avenue.

WALTER DOUGAN WOOD, JR., has been appointed to the sales staff of the Philadelphia Office of The Lincoln Electric Co., Cleveland, Ohio. Mr. Wood is a graduate of Cornell University, class of 1936.

C. H. BOENIG of Youngstown, has been appointed sales engineer for the Harnischfeger Corp., Milwaukee, to handle the entire line of Harnischfeger products in the entire western section of New York.

FRANK HICKS has joined the advertising department of Crane Company, 836 So. Michigan Ave., Chicago, as a publicity representative. His experience embraces 17 years in newspaper, trade magazine and general publicity work.

J. M. ROBINSON, for the past 12 years district manager for the Detroit territory for Lincoln Electric Company is establishing his own business in Detroit. Office and warehouse will open October 1, under the name of J. M. Robinson at 1921 East Ferry Ave. Mr. Robinson will continue to handle the Lincoln Electric Company line as a supplementary organization to the district office of the Lincoln Electric Company in Detroit. F. M. MAICHLE, formerly district manager of the Pittsburgh territory of the Lincoln Electric Company, has been appointed district manager of the Detroit territory succeeding Mr. Robinson.

REGISTERED U. S. PATENT OFFICE

MANGANAL

Broken and Worn Wobblers and Spindles restored by welding with manganal bare (uncoated) electrodes.

11 to 13½% Nickel Manganese Steel
U. S. Patents 1,876,738 1,947,167 and 2,021,945

WELDING ELECTRODES
FOR WELDING AND BUILDING UP
worn down and broken *11 to 14%* manganese *steel* castings and rolled parts.
FOR ARMORING BY WELDING
any steel surface subjected to severe impact and abrasion.

MANGANAL Bare (Uncoated) ELECTRODES supply the following superior features:

No slag covering over weld deposit. Air Toughening of weld deposit. Less heat into parent metal. Can be peened immediately after deposition while hot. Weld deposits are always uniform and never contain less than 11% of Manganese. Great strength and ductility. Weld deposit work hardens more rapidly under impact and abrasion. No unpleasant fumes when depositing. No checking of weld deposit. All elements are contained in the metal which gives the correct analysis in the weld. *Send for Illustrated Catalog*

STULZ - SICKLES CO. Sole Producers
91 N. J. Railroad Ave. NEWARK, N. J.

THE LINDE AIR PRODUCTS COMPANY, unit of Union Carbide and Carbon Corp., has opened a new sales office in Oakland, Calif., at 3710 San Pablo Ave. The opening of this new office on September 1, 1937, brought the number of Linde offices throughout the country to a total of 33. This office will serve the Oakland area.

LORN CAMPBELL, JR., of the Harris Calorific Co., Cleveland, Ohio, sailed for Europe from Montreal on August 27 where he is spending some time in Scotland, England, Germany and France. He is expected home sometime after the first of October.

OLIVER H. VAN HORN CO., INC., 522 Camp St., New Orleans, La., with branches in Houston, Tex., and Shreveport, La., has been appointed distributor by Stulz - Sickles Co., Newark, N. J., to handle Manganal products in that territory.

STEEL & TUBES, INC., subsidiary of Republic Steel Corporation, Cleveland, Ohio, has opened a branch office in Baltimore, Md., according to an announcement by L. W. Harston, vice president in charge of sales. H. H. SMITH is in charge of the new office and will handle the entire line of products, including Electrunite, mechanical, boiler, condenser, stainless steel and structural, rail, carbon steel, tubing, Electrunite Steel tubes and conduit.

J. E. DILWORTH COMPANY has been appointed exclusive distributor for Murex heavy-coated Electrodes in

Ryerson a dependable source for Welding Rod

● Ryerson Engineers have developed a series of rods that are outstanding for Quality production. More than twenty types, including both electric and gas rods, are carried in stock. Whether you need a shielded arc type for production work or a stainless steel rod you can be sure of immediate shipment . . . *Write for Bulletin which gives complete data.*

Ryerson Shielded Arc Type No. 215
Shielded Arc Type No. 216
Shielded Arc Type No. 217
Green Processed No. 18
Copper Coated No. 206
Copper Coated No. 210
Cast Iron

ELECTRODES
Ryerson Green Processed No. 6
Bare Mild Steel
Brown Processed
White Flux Coated
High Carbon White Flux Coated
Blue Flux Coated

GAS RODS
3½% Nickel Steel
High Carbon Bare No. 2110

Ryerson 3½% Nickel Steel Flux Coated
High Manganese Steel Hard Surfacing
Allegheny Stainless Flux Coated
Allegheny Stainless No. 44
Tobin Bronze
Allegheny Stainless Bare Hard Filler

JOSEPH T. RYERSON & SON, Inc., Chicago, Milwaukee, St. Louis, Detroit, Cleveland, Cincinnati, Buffalo, Boston, Philadelphia, Jersey City

the South-Central territory. With headquarters in Memphis, this company covers western Tennessee, eastern Arkansas and northern Mississippi, as well as adjoining portions of the states of Alabama, Louisiana and Missouri.

R. R. DAVIS, formerly apparatus advertising manager of the Westinghouse Electric & Manufacturing Company, has been appointed assistant to the general advertising manager of the company. Mr. Davis has been associated with Westinghouse advertising activities since 1910. For the present, his offices will continue to be in the East Pittsburgh Works, though he will be located in the new Pittsburg headquarters of the company as soon as advertising offices can be established there.

W. F. PICKHAN, field welder for the Morrison Metalweld Process, Inc., has joined the company's sales force at the Chicago office, one of the two main offices of the Metalweld Process, head offices of which are at Buffalo, N. Y.

H. R. WHETSTINE has joined the J. D. Adams Company, Indianapolis, Ind., as a welding equipment salesman and demonstrator. He will cover Kansas, Nebraska, Oklahoma, Missouri, and part of Iowa.

Trade Literature

ELECTRIC SPOT AND BUTT WELDING MACHINE, catalog 38W, recently issued by Eisler Engineering Co., 750 S. 13th St., Newark, N. J. contains illustrations and specifications of important features of many types of spot and butt welders, wire portable and special welders, high frequency and brazing and soldering machines, spot welding timers and miscellaneous welding accessories. One hundred pages and 1250 illustrations cover many welding problems. Copies are available from the company at its home office.

"WELDED PIPING," a 12-page illustrated booklet, published by The Linde Air Products Co., New York, covers the advantages of welded joints in installing piping systems. Subjects of particular interest to builders, architects and engineers are treated in sections on: pipe and services to be welded; lighter than standard weight pipe; fast, economical welding methods; layout, drawings and specifications; welded joints and fittings; plan of construction; shop and field fabrication, and piping erection.

"HARD-FACING WITH HAYNES STELLITE PRODUCTS," is now being issued by Haynes Stellite Co., Kokomo, Ind., a unit of Union Carbide and Carbon Corp. New sections present information concerning special Haynes Stellite J-Metal cutting tools and an improved welding technique for fabrication of equipment employing the corrosion-resistant Hastelloy alloys. Copies are available without obligation from Haynes Stellite Co., Kokomo, Ind.

C. L. JARVIS Co., Middletown, Conn., has just issued Catalogue M. S. T. covering its complete line of flexible shaft driven tools. Small bench types, floor types, overhead trolley types, overhead saddle types and roller floor types, are described. The new Jarvis "Vario-Flex" grinder is illustrated and its operating advantages set forth. A detailed description of this model will be found in the "New Products" section of this issue. The catalogue also describes the Jarvis power-driven screw drivers and nut setters.

COMPARE!!

No other welding hose like "Supero-SIAMEEZ"
—no other will give you its five important advantages

It will pay you to learn the difference between *Supero-SIAMEEZ* and other hose offered as solution to the problem of tangled, fouled lines. Compare them. You'll see why Supero-SIAMEEZ is the common choice of buyers who seek the best hose for their money.

No other has the "SIAMEEZ" web joint that actually strengthens the hose wall at junction point. It is safer, stronger, more permanent, and highly flexible.

No other has the extra spiral cord reenforcement between two layers of braid which provides far greater burst strength without sacrificing flexibility. This "Supero" construction is exclusive with Electric Hose & Rubber Co.

And, you can be sure that few, if any, have a tube as smooth, leak-proof and enduring . . . or a cover as tough. For products of "the hose specialists" are famous for those qualities.

Get all the facts and you, too, will insist on Supero-SIAMEEZ. Write for our folder of information, and the names of distributors near you.

ELECTRIC HOSE & RUBBER CO.
WILMINGTON, DELAWARE

SUPERO Siameez

Product of The Hose Specialists

ELECTRIC HOSE & RUBBER CO.

. . . . . MODERN

If a man had magic boots capable of covering 1000 leagues at a stride, it would still take him many weeks each year to see the most important developments in the metal industry. In five days at the National Metal Show he can see them all—and that's no fairy story!

By spending five days at Atlantic City in October you will see displays of more than 225 leading industrial organizations . . . actual operating exhibits of newest developments in plant and research equipment . . . every aisle in the huge auditorium packed with ideas in metal research, production and equipment . . . every exhibit manned by metal experts welcoming questions about their products.

In addition, you can hear any of the more than 145 authoritative technical papers to be presented at the Congress sessions of the

THOUSAND LEAGUE-BOOTS

five great technical societies co-operating in the Congress. Prepared by outstanding authorities, these papers background the practical production lessons of the Exposition with the up-to-date technical information so vital to success in today's metal industry.

For complete program, address American Society for Metals, 7016 Euclid Avenue, Cleveland, Ohio.

Make your preparations for National Metal Show now . . . don't forget that every step you take at the Show will be like walking in "thousand league" boots! For hotel reservation write Wm. B. Coleman, Chairman, Committee on Hotels, 16 Central Pier, Atlantic City, New Jersey.

Sponsored by
THE AMERICAN SOCIETY for METALS

October 18-22
ATLANTIC CITY AUDITORIUM

NATIONAL METAL SHOW

AMERICAN INSTITUTE of MINING & METALLURGICAL ENGINEERS
THE WIRE ASSOCIATION

AMERICAN SOCIETY of MECHANICAL ENGINEERS
AMERICAN WELDING SOCIETY

Miscellaneous

EDWARD J. BRADY, formerly in charge of the welding division of Jos. T. Ryerson & Sons, Inc., Chicago, has joined the Hollup Corp., Chicago, as sales engineer in charge of sales and engineering of stainless steel and other alloy steel electrodes.

THE OPERATING RATE of steel companies having 98 per cent of the steel capacity of the industry was 80.4 per cent of capacity for the week beginning September 13, compared with 72.5 per cent one year ago.

THE HARNISCHFEGER CORPORATION of Milwaukee, Wis., announces the appointment of the TERRE HAUTE HEAVY HARDWARE CO., 545 North 13th St., Terre Haute, Ind., as exclusive agent for Smootharc welders and welding electrodes. Inasmuch as this territory is partly in the Chicago and partly in the St. Louis branch office territories, this distributor will maintain contacts with both branches.

J. M. MCKIBBIN, JR., associated with the Westinghouse Electric & Manufacturing Company since 1922, has been appointed apparatus advertising and sales promotion manager of the company. Mr. McKibbin has served Westinghouse in various advertising, sales promotion, and industrial sales capacities since he joined the company.

His first position was in the sales promotion division of the Pittsburgh office. In 1924, he became advertising manager in the Cleveland office, and three years later was in charge of similar activities in the Detroit office. When the Central Sales District was formed, with headquarters in Pittsburgh, some years ago, he was placed in charge of advertising activities of the company in the important industrial areas of Ohio, Pennsylvania, Michigan, Kentucky, and West Virginia.

Later he moved his office to East Pittsburgh where he had charge of sales promotion operations involving all industries served by Westinghouse equipment. In 1936, he was appointed apparatus sales promotion manager to coordinate all such activities, except those involving Westinghouse merchandising equipment.

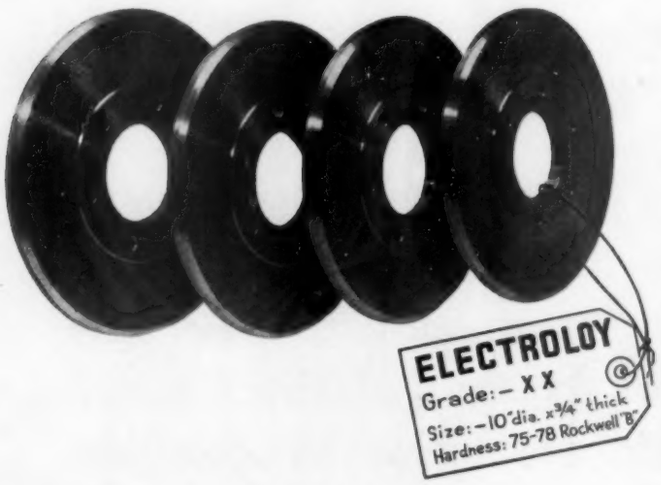
"ORGANIZATION WORK in Connection with Fabrication of Large Welded Pipe Line Contracts," was the subject discussed by L. W. Delhi, general manager, Western Pipe & Steel Co., at the first fall meeting of the San Francisco section, American Welding Society, which was held August 20. The meeting followed the usual 6:30 dinner, at the Engineers Club, 206 Sansome St., San Francisco. In addition to Mr. Delhi's interesting talk, K. V. King reviewed the more important current literature pertaining to the welding industry.

WELDING WILL ENTER extensively into the construction in the near future of a 6,000-bbl. oil-skimming plant to be erected near Corpus Christi, Texas, by subsidiary interests of the Crude Oil Pipe Line Co., Houston, Texas.

A LARGE AMOUNT of welding went into the recent structural steel work of the $100,000 addition to the Pacific Goodrich Tire & Rubber plant at 5400 East Ninth St., Los Angeles. The building is a Class A earthquake-proof structure. The addition will increase the production of the plant to 6,000 tires per day.

THE METALLIZING ENGINEERING CO., INC., announces the following sales and engineering staff promotions: W. C. REID, formerly midwestern manager with offices in Chicago, has been appointed vice president in charge of sales, and will make his headquarters at the main offices in New York City on or before November 1. WALTER B. MEYER, formerly manager of the St. Louis office, has been appointed manager of the Chicago office. ALAN B. GEUDER, formerly connected with the Chicago office as a salesman, will take over Mr. Meyer's duties in St. Louis.

Visit us at the Hotel Traymore, Atlantic City During Metal Show Week, October 18-22



Electroloy Seam Welding Rolls

Each Electroloy Seam Welding Roll is individually tested for hardness. This insures high, uniform production from every roll. An increase in electrode life of from six to twelve times that of copper will be obtained from Electroloy alloys.

These Seam Welding Rolls are carried in stock sizes, made of various alloys, suitable for all seam welding requirements. *Catalog on request.*

Electroloy engineers will be glad to assist in working out individual welding problems.

ELECTROLOY COMPANY, INC., 50 Church St., NEW YORK

Manufacturers of all types of resistance welding electrodes and dies

ELECTROLOY ALLOYS